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The Precursor Relationship between Married Individuals' Values, Attachment and Appearance Anxiety

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Abstract

The aim of this research is to investigate the precursor relationship between values, attachment styles, and appearance anxiety of married individuals. Structural equation modeling analysis has been carried out in order to test the relationship among values, attachment, and social appearance anxiety variables in the research. Structural equation modeling analysis has been carried out with AMOS 19 program. In the research, the "Personal Information Form" to collect the necessary data, the "Values Scale" to determine the values of married individuals, "Experiences in Close Relationships Inventory-I" to determine the attachment styles of married individuals, and "Social Appearance Anxiety" scales to determine appearance anxiety were used. Percentage and frequency calculations of the collected data have been created with the SPSS 18 package program. According to the analysis results obtained from the study, it has been seen that there is a meaningful negative relationship when the precursor relationships between values and appearance anxiety are examined. In other words, it has been concluded that as the values of individuals increase, their appearance concerns will decrease. Additionally, when the precursor relationships between attachment styles of married individuals and appearance anxiety are examined, it has been determined that there is a positive linear relationship. Accordingly, it has been determined that individuals' attachment styles will positively affect their appearance anxiety.

Key Words

Values • Attachment styles • Social appearance anxiety

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The family is an institution that is accepted as an indispensable and common value by societies with roots in the past, ensures the continuity of generations and supports the socialization process of people (Popenoe, 1982). Satir (2016) defines the family as a miniature of the world. We only need to study the family to understand the world; issues such as power, intimacy, autonomy, trust and communication skills are the basis of our way of life on Earth. Marriage has an important effect on the constitution of the family, which is one of the cornerstones of society (Çelik and İnanç, 2009). Marriage is a more special term than family. Marriage is a "contract" that involves two people of the opposite sex living together, sharing their experiences, having a child and raising her while family is referred to a group or association. it is, socially, a form of legal relationship in which the "state" has control, rights and authority provides a certain status to the children to be born, and binds them as husband and wife (Özgüven, 2017).

Marriage, which has existed throughout human history, has preserved its basic structure until today and has never lost its feature of being an important turning point of human life (Ondaş, 2007). Marriage is a social order with emotional, behavioral and biological dimensions although it is defined in different ways from society to society, from culture to culture (Kışlak, 1999). Just as the rights and responsibilities of individuals in marriage are determined by social rules, traditions and beliefs, they are protected by laws (Özgüven, 2017). Transferring the values of the society we live in to future generations starts with the family established with marriage. For this reason, it is very important that marriage is built on solid basis (Çatal, 2019). Each member of the family has positive and negative values that they contribute to the family. What values the individual has is important here (Satir, 2016).

“The basic principle of the family home is peace.” (Nirun, 1994). Spouses must love and respect, care and value each other as human beings and spouses in order to ensure peace (Çagatay, 1991). Married individuals who share each other's feelings and thoughts with their spouses make each other happier and can lead a more harmonious family life (Yıldırım, 1992). Marriage is the human’s biological requirement. In male-female relationships, the man gives love and wants sex; the woman gives sexuality, asks for love and affection. Due to their psychological nature, women keep sexuality in the background because they attach more importance to being valued and meeting their emotional needs (Tarhan, 2019). In addition to the expectations of women and men from marriage, their marriage values also differ. In other words, individuals form the degree and quality of their relationship with their spouses according to the values they have. When marriage is evaluated as 'sharing life', it is thought that the similar or common values that shape the lives of the spouses who are the partners of this sharing will have an impact on the satisfaction they will get from marriage (Çatal, 2019).

The science of psychology aims to find the root causes of human behavior (Cüceloğlu, 2016). From this point of view, the importance of the term of value in psychology is understood not whether it is based on objective elements, but whether it is a guiding factor in human behavior (Güngör, 2010). Values, which have fundamental importance in explaining and describing human behaviors, are closely related to the behaviors and attitudes of individuals as well as their emotions and thoughts (Dilmaç, 2007). Values carry the characteristics that make humans human and direct one's behavior with beliefs just as they contain the basic features that distinguish human beings from other living creatures (Ulusoy and Dilmaç, 2018).

Value is a desirable behavior of people, a goal that guides them in arranging their priorities in a person or a group's life, and may vary from situation to situation (Lönnqvist et al., 2009). Values of the individual are personal values such as love, respect, honesty, fairness, open-mindedness, commitment, and being able to control, which emerges in interpersonal relationships (Kuçuradi, 1995).

Values have importance in establishing and maintaining relationships based on love, respect, trust and self-sacrifice with the close or distant environment in which people live at any age, reorganizing them when their mental health deteriorates, and meeting the society and the individual at a healthy common point. It units individuals around common feelings and reinforces social peace (Safi, 2018). At the same time, when we know the values of individuals, communities and different cultures, we can predict their attitudes and behaviors to a large extent (Başaran, 1992).

The marriage of two adults with the intend of creating a family brings together their values and expectations. People's value judgments change over time to suit their coexistence (Minuchin and Fishman, 1996). According to attachment theory, people's emotional support, care needs and sexual satisfaction needs are met by social relationships. We have specific signals in our social environment to meet these needs, and individuals who respond to or exhibit these cues are attractive to us. The most basic need, "felt security," is controlled by attachment, and in finding answer this life-long need, a potential partner's signals must be similar to ours (Hazan and Shaver, 1994).

Attachment is the strong emotional bond that individuals develop for others they assume important and special (Çelik, 2004). The desire to form emotional bonds provides an effective attachment system for infants' development and is essential for their survival. The attachment system enables the child to establish a strong physical closeness with the caretaker, thus it creates an opportunity to explore the environment while being protected from potential dangers (Sümer and Güngör, 1999). Bowlby (1969) states that attachment is a process from the cradle to the grave, and the mental models formed at an early age continue to operate without much change in adulthood (see, Erben and Çalışkan, 2015).

When the nature of romantic relationships is taken into account, every romantic relationship is an attachment process, and the choices of partner and marriage decision are affected by attachment styles. Since attachment is related to the expectations and beliefs of the individual from himself and the other person, it will affect both the marriage and the choice of spouse, which is the premarital stage (Solmuş, 2010). Attachment styles that develop to caregivers in the first years of human life and attachment styles established in adulthood in a romantic relationship are similar to each other (Gündoğan, 2015).

Hazan and Shaver (1987), who studied adult attachment styles, applied the classification made by Ainsworth et al. (1978) to adults and suggested that "secure, anxious/ambivalent and avoidant" styles are also seen in romantic relationships (Günaydın et al., 2005). Many studies have been conducted on adult attachment styles under the leadership of this study. Bartholomew and Horowitz (1991) proposed the quadruple attachment model by addressing the basic propositions of attachment theory, mental models (self and others), and anxiety and avoidance dimensions in attachment with Brennan et al. (1998). There is a relationship between the anxiety dimension and the self-model;

and between the avoidance dimension and the others model. Secure attachment and anxious attachment styles are low; Fearful attachment and preoccupied attachment represent high levels of anxiety (Sümer, 2006).

Vertue (2003) on the studies of Bartholomew and Horowitz (1991) and Brennan et al. (1998) on the effects of our attachment behaviors on the anxiety and avoidance dimensions of individuals, argues that different approaches explaining social anxiety do not provide information about the development of social anxiety and that attachment theory can offer an explanation for social anxiety by bringing together social anxiety theories in a coherent way. Social anxiety is based on a wide variety of causes. While feeling anxiety, fear and discomfort in social environments, the person deliberately avoids those environments and is afraid of being negatively evaluated by others (Erkan, 2002).

According to Bowlby (2018), the basis of adult anxiety is based on childhood experiences and attachment processes are important in understanding anxiety. In this context, it is thought that social appearance anxiety, which is a type of social anxiety, may be related to attachment. According to Erikson's (1968) psychosocial development theory, in the developmental period called isolation versus intimacy, the appearance anxiety of individuals may affect their lives and mental health more negatively (see, Rosenthal et al., 1981). According to Erikson (1963, 1965, 1983), the developmental task of individuals at this stage includes finding oneself in another person and devotion to someone; that is, marriage issues and marriage take an important place in the individual's life in this period. The individual who completes his development task in a positive way performs a healthy attachment process by trusting himself and other individuals. S/he gives them love - takes love from them (Senemoğlu, 2013). At this stage of development, physical attractiveness, which plays a decisive role in establishing intimacy with other individuals, is important for individuals. Therefore, if individuals have appearance anxiety, they may experience problems during their developmental period (Makas and Çelik, 2018).

Social appearance anxiety is the fear of being negatively evaluated because of one's appearance (Hart et al., 2008). Appearance anxiety is evaluated as a result of negative body images of individuals about their own body and appearance (Doğan, 2010). Individual's development of personality; features such as increased self-confidence, being a social person, being mentally, physically and psychologically healthy are the products of the individual's body image (Öksüz, 2012). Socio-cultural attitudes and values can also affect one's body image, and one's body image may be incompatible with its real structure (Kundakçı, 2005).

Marriage is a structure that includes various dynamics and it has an important place in the lives of individuals to reach both physiological and psychological satisfaction. When the studies in the literature are examined, although studies on the values, attachment styles and social appearance anxiety of married individuals are separately found, it has not been found that these three psychological concepts are examined together. Accordingly, it is thought that this research will fill this gap in the literature and will be important for future studies.

Method

Research Model

In the study, it is aimed to determine the precursor relationship between values, attachment and appearance anxiety in married individuals. The relational survey model, which is a sub-type of the general survey model, will be used for the research. Correlational model is a model used to determine the existence or degree of covariance between two or more variables (Büyüköztürk et al., 2014).

Study Group

The study group of the research consists of 355 adults, 265 females and 90 males. The age range of the study group is between 21 and 64 years old.

Data Collection Tools

Personel Information Tool

In the form developed by the researcher, the demographic characteristics of the participant, including gender, age, place of residence, income status information, duration of marriage, degree of intimacy with their spouses, the number of children they have, the status of family approval of marriage, and the status of living in their house other than spouse and children has been studied.

Scale of Values

The scale has been developed by Dilmaç et al. (2014), and it has 10 Likert-type (0: Not important at all, 9: Very important), 39 value expressions and 9 sub-dimensions.

Sub-dimensions of the scale have been determined as;

a. Social Values
b. Career Values
c. Intellectual Values
d. Spirit
e. Materialistic Values
f. Human Dignity
g. Romantic Values
h. Freedom
i. Generosity

The lowest score that can be obtained from the scale is 0, and the highest score is 9. The higher score student gets from the scale, the more importance person attaches to values, and it shows that this is indispensable in her life.

When the Cronbach Alpha internal consistency and reliability parameters of the scale are calculated, according to each sub-dimension; it has been calculated as 90 for "Social Values", 80 for "Career Values", 78 for "Intellectual Values", 81 for "Spirituality", 78 for "Materialistic Values", 61 for "Human Dignity", "Romantic Values" 66 for "Freedom" and 63 for "Generosity". As a result, in the light of these data, it has been concluded that the Values Scale is a valid and reliable measurement tool with its first psychometric findings (Dilmaç et al., 2014).

Inventory of Experiences in Close Relationships -I (ECRI-I)

Attachment styles have been tested with the Experiences in Close Relationships Inventory-I in the study. ECRI-I, which has been developed by Brennan and his friends (1998) aims to measure anxiety and avoidance, which are sub-dimensions of attachment in close relationships. The scale consists of 36 items in total, and the anxiety dimension is measured with 18 items and the avoidance dimension with 18 items. In this scale, participants rated the extent to which each item describes themselves on a seven-point scale (1 = does not describe me at all, 7 = completely describes me). ECRI-I has been used in various researches and postgraduate theses. The factor structure of the scale has been tested by Sümer (2006); two dimensions have been obtained as anxious and avoidant attachment. As a result of the study, it has been found that both dimensions have high reliability parameters (.86 for anxiety and .90 for avoidance).

Social Appearance Anxiety Scale

Social Appearance Anxiety Scale (SAAS) has been used in the study to determine the appearance anxiety levels of married individuals. The Social Appearance Anxiety Scale is a 5-point Likert-type scale consisting of 16 items. First item of the scale was coded in reverse. High scores from SAAS indicate that appearance anxiety is high. It is a scale developed by Hart et al. (2008) to measure an individual's emotional, cognitive and behavioral concerns about his or her appearance. The validity and reliability study of the Turkish adaptation of the scale was carried out by Doğan (2010). 340 university students (143 girls, 197 boys) participated in the study. The Fear of Negative Evaluation Scale Short Form (FNES) was used to test the criterion validity. Explanatory and confirmatory factor analysis was performed to reveal the factor structure of SAAS. Factor analysis results revealed that the scale had a one-dimensional structure. It has been found out that The Cronbach Alpha internal consistency parameter for SAAS is .93, the test-retest reliability parameter is 0.85, and the reliability parameter calculated by the test-half method is 0.88. It has been concluded that the item-total correlation parameters of Turkish version of the scale ranged from 0.32 to 0.82. A correlation of 0.60 has been found between SAAS and FNES. Analyzes have showed that SAAS has sufficient validity and reliability values on Turkish university students (Doğan, 2010).

Data Collection and Analysis

In the data collection of the study, the "Personal Information Form" created by the researcher to obtain the demographic information of the married individuals in the sample group, the "Values Scale" to determine the values they have, "Experiences in Close Relationships Inventory-I to determine attachment styles, and "Social Appearance Anxiety Inventory" were used to detect appearance concerns. It is aimed to reveal the precursor relationships between the values of married individuals and their attachment and appearance anxiety. For this purpose, the analysis

has been carried out using the "Structural Equation Modeling" AMOS 19 Program. The main purpose of structural equation modeling is to test the proposed hypothesis and reveal the relationship between latent variables (Sümer, 2000).

Results

The final model (X^2 = 205.89, df = 85, p < .01) includes two exogenous data (values and attachment styles) and one endogenous (social appearance anxiety) data. All of the paths shown in the model have been found to be statistically meaningful. When the goodness of fit values in Table 4.1 are examined, it has been seen that the model is compatible at an acceptable level. All relationships in the model have high values and are statistically meaningful (p <.05).

Table 1

Statistical Values Regarding the Fit of Structural Equation Model

Measurement	*Successful fit*	*Acceptable Fit*	*Fit values of the model*
(X^2/sd)	≤ 3	≤ 4-5	2.42
RMSEA	≤ 0.05	0.06-0.08	.06
SRMR	≤ 0.05	0.06-0.08	.06
NFI	≥ 0.95	0.94-0.90	.92
CFI	≥ 0.97	≥ 0.95	.95
GFI	≥ 0.90	0.89-0.85	.93
AGFI	≥ 0.90	0.89-0.85	.90
TLI	≥ 0.95	0.94-0.90	.94

When the fit values in Table 4.1 are examined, it has been found that *X2*/sd = 2.42, RMSEA = .06, SRMR = .06, NFI = .92, CFI = .95, GFI = .93, AGFI = .90 and TLI = .94. According to these values, it is understood that the model has an acceptable level of goodness of fit values (Bollen, 1989; Browne and Cudeck, 1993; Byrne, 2010; Hu and Bentler, 1999; Kline, 2011; Tanaka and Huba, 1985). The tested single factor model is shown in Figure 4.1. All paths shown in the model are meaningful at the p < .05 level.

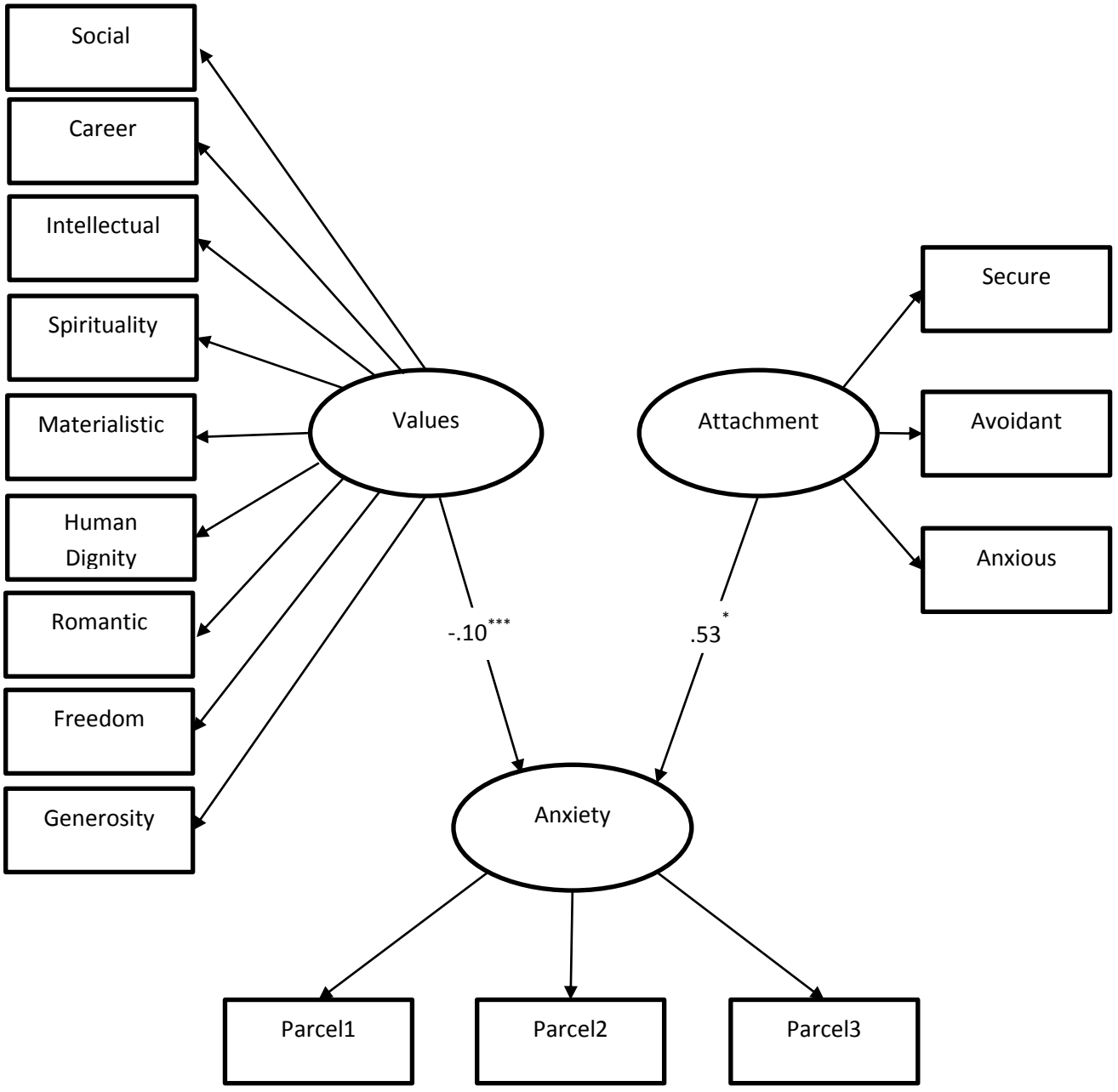

Figure 1: Path analysis of the model. *** p < .001, * p < .0

Table 2

Model for Precursor Relationships between Values, Attachment Styles, and Appearance Anxiety

Precursor Variable	Dependent Variable	Total Effect[a]	Direct Effect	Indirect Effect	Standard Error	Critical Value
Value	Appearance Anxiety	-.10	-.10	0	.23	-1.98***
Attachment	Appearance Anxiety	.53	.53	0	.04	8.76*

[a] Total effect = Direct effect + Indirect effect, ***$p < .001$, *$p < 0.05$.

In the model, it has been seen that individuals' attachment styles were a variable affecting their appearance anxiety ($t = 8.76$, $p < 0.05$). The correlation parameter value for this variable is $\beta = 0.53$. When the precursor relationships between individuals' attachment styles and appearance anxiety are examined, it has been determined that there is a positive linear relationship. Accordingly, it is understood that individuals' attachment styles will positively affect their appearance anxiety.

Discussion

In this section, the results obtained in consequence of examining the precursor relationships between values, attachment and appearance anxiety of married individuals who constitute the study group of the research are discussed. When other studies in the field are examined, it has been observed that there are limited studies in terms of subject and data collection tools. In this context, the research questions to be answered in order to achieve the main purpose of the research are discussed within the framework of the literature with the results obtained from analyzes. In the research, a three-variable model was created with married individuals. When the findings are examined, there are two exogenous, values (social, career, intellectual, spirituality, materialism, human dignity, romantic, freedom, generosity) and attachment styles (anxiety and avoidance) and an endogenous (appearance anxiety) data from the ways shown in the model obtained. Each of them has high values and has been found to be meaningful. According to these values obtained from the study model, it is understood that the model has an acceptable level of goodness of fit values.

In the study, when the precursor relationship between the values of married individuals and appearance anxiety is considered, a negative meaningful relationship has been found. In other words, to put it differently, it has been concluded that as the values of individuals increase, their appearance anxiety will decrease. When similar studies are examined in the literature, the concept of appearance anxiety is a new concept, but the researches are quite limited. At the same time, no studies have been found about the concepts of values and social appearance anxiety with married individuals. Seki and Dilmaç (2015) have found that there is a negative relationship between social appearance anxiety in adolescents and the human values scale sub-dimensions of responsibility, friendship/friendship, respect, honesty, and tolerance. Seki and Dilmaç (2015) showed similarity with their study,

although the results of our study were applied to different age groups and groups in different roles. Likewise, Yücesoy (2019) has found a negative linear relationship between values and social appearance anxiety in her study with university students on values, social appearance anxiety and irrational beliefs. In other words, it has been determined that as the values of individuals increase, their social appearance anxiety will decrease. The study of Yücesoy (2019) and the results of our study support each other, and it is seen that values are an effective variable in predicting social appearance anxiety. Hart et al. (1989) considered social appearance anxiety as a kind of social anxiety and defined it as anxiety arising from the evaluation of the physical appearance of individuals by others. In this context, when literature studies are reviewed, Baş and Dilmaç (2019) have found that social anxiety decreased as the values of individuals increased in their study with adolescents. Mert (2019) examined the effect of values and perfectionism on predicting social anxiety in her study with university students and found that the most important variable in predicting social anxiety was values. He found a negative linear relationship between values and social anxiety, which supports other studies. When the results of the studies in the literature in which value and social appearance anxiety are examined together, it is understood that values and social appearance anxiety are two interrelated concepts and that the values possessed affect social appearance anxiety. In the light of all these findings and the results obtained from the study, the existence of human values is in the direction that individuals will reduce to compare themselves with each other and to evaluate themselves accordingly. The results of the study are consistent with the idea that individuals will experience less anxiety when they are in a positive mood and can look at the other person in a tolerant way. Thus, it can be said that the findings obtained from the study we conducted with married individuals and the literature studies support each other.

In the study, when the precursor relationship between attachment styles and appearance anxiety of married individuals is considered, it has been seen that attachment styles affect appearance anxiety and have a positive linear relationship. When similar studies in the literature are examined, the limited number of studies and the absence of studies in married individuals make our study unique. Considering the studies on attachment and social appearance anxiety variables; Aktaş (2020), in his study with adolescents, has found that there is a moderately meaningful and negative relationship between the mean score of attachment to the mother and the mean score of appearance anxiety. When the findings we obtained are evaluated, a positive relationship has been observed between attachment styles and appearance anxiety in our study. However, Aktaş (2020) has found a negative relationship between attachment styles and appearance anxiety. The reason for the difference in the results of these two studies is that one of them is based on the mother and father attachment score, and the high score obtained from the used inventory represents secure attachment. That is, as the attachment style is secure, social appearance anxiety will decrease. However, our study is based on the anxious and avoidant attachment style, and as the scores obtained from these attachment styles decrease, social appearance anxiety will also decrease. The difference in the results obtained here may be due to the study with different groups. However, Sümer and Şendağ (2009) determined that being securely attached to parents is effective in a positive perception of physical appearance's formation of in middle childhood. The study of Sümer and Şendağ (2009) is similar to our research, although it has been applied to different age groups. As a result of the one-way analysis of variance between social appearance anxiety and attachment styles, Temel (2018) has found that social appearance anxiety differed meaningfully according to attachment styles. It has been found that the social

appearance anxiety of the securely attached participants was meaningfully higher than the fearful and indifferently attached participants. The lack of similarity between Temel (2018)'s study and the results of our research can be explained by the conclusion that different results can be obtained in the studies of the relationship between attachment styles and social appearance anxiety, and that more studies should be conducted on these two variables in the field. Since appearance anxiety is considered as a sub-type of social anxiety, studies on social anxiety and attachment in the literature have also been examined. In his study on the relationship between social anxiety and attachment styles, Karaşar (2014) has found a negative relationship between secure attachment and social avoidance, a positive relationship between fearful attachment and social avoidance, a positive relationship between fearful attachment and social anxiety, and a positive relationship between preoccupied attachment and social anxiety. According to the research findings of Dilmaç et al. (2009), trait anxiety scores of individuals with preoccupied and fearful attachment have been found to be significantly higher than individuals with secure attachment style. In addition, the trait anxiety mean scores of the fearfully attached students were found to be meaningfully higher than the indifferently attached students. Zörer (2015) has concluded that participants with obsessive, fearful and dismissive attachment have higher social anxiety scores than participants with secure attachment. He has also found that the obsessive-attached participants have higher social anxiety scores than the dismissive-attached participants. When the social anxiety studies and the findings we obtained are evaluated, the similarity of the results supports our study. In many of the studies in the literature, a significant relationship has been found between individuals' attachment styles and appearance anxiety, and it has been concluded that individuals' attachment styles predict their social appearance anxiety. As a result, there is a significant relationship between individuals' attachment and social appearance anxiety, and it can be said that the fact that our study was conducted with married individuals would make an important contribution to the field.

Ethic

This study was conducted in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments. Informed consent was obtainted from all students.

Author Contributions

All of the authors contributed equally in the article.

Conflict of Interest

The authors declare no conflict of interest in the research.

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Examining Middle School Mathematics Student Teachers' Post-Observation Conferences

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Abstract

Teaching practicum allows prospective teachers to use the theoretical and practical knowledge they have learned as a student. The conferences held with the participation of the cooperative teachers, prospective teachers, and their peers that take place after each course, carry great importance for prospective teachers to develop their professional skills. This study aims to examine the conferences held after the practice courses in terms of type and content. Two conferences of 11 prospective teachers, who undertake teaching practicum in Muğla Sıtkı Koçman University, Department of Elementary Mathematics Education were analyzed through content analysis. It was observed that prospective teachers generally took into account the criticisms in the conferences after the first practice and took action to improve their second teaching session. The criticisms made in the second set of meetings were found to be more positive than the previous ones. Therefore, it can be said that post-conference evaluations of the prospective teachers contribute to their professional skills.

Key Words

Practicum • Prospective teachers' reflections • Evaluation post-observation conferences

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There are numerous research highlighting the teaching practicum as an important part of teacher education for prospective teachers' developing professional identities and their practice of teaching (Darling-Hammond et al., 2005; Valencia et al., 2009). Practicum allows prospective teachers to experience theory and practice simultaneously to establish a balance between the two. Prospective teachers have a chance to practice their competences in real-life situations and under the supervision of more experienced teachers (Clarke et al., 2014; Vartuli et al., 2016). Their experiences primarily include learning about their profession in a practical context, getting familiar with some basic skills required in their professional life, and putting the theoretical knowledge they have acquired during teacher education into practice. Some studies have also revealed that prospective teachers are unsuccessful or struggling with putting the theoretical knowledge they have acquired during their learning process into practice (Emre-Akdoğan & Yazgan-Sağ, 2019; Frykholm, 1996). Researchers have used various terms to refer to teachers who supervise prospective teachers in practice settings; such terms include supervising teachers, mentors, and cooperative teachers. In this study, the term cooperative teacher refers to the teachers in the classrooms and are assigned to the task of supervising teacher students in the practice.

Many studies in the review by Clarke et al. (2014) reported that prospective teachers (PTs) evaluate their teaching practicum as one of the most important components of their initial teacher education. Therefore, prospective teachers need to have an effective and productive practicum to have their teaching experience as efficiently as possible. This efficient practicum process should pay attention to factors such as the prospective teachers' effective guidance, guidance and observation of model applications by the cooperative teachers in schools (Eraslan, 2008; Paker, 2008); the university supervisors' ability to provide effective and on-site guidance and feedback to the prospective teachers (Eraslan, 2008; Paker, 2008); and the ability to maintain teaching experiences in the classroom environment for a long time for the prospective teachers to improve their practices (Baştürk, 2010; Kuran, 1992). Among all these opportunities, the most important basic structure that affects the professional development of the prospective teachers is self-assessment, and feedback from their lecturers and their mentor teachers regarding the process of teaching practicum. During the teaching process, the prospective teacher should be aware of the issues that need improvement regarding their teaching methods by taking into account the evaluations of the teacher and the lecturer at the post-monitoring conference (after the lectures). Chaliès et al. (2004) emphasize that the supervised prospective teachers needs to be involved as an active participant in the post-monitoring conference in which the supervisor and supervisee collaboratively analyze the data from observation and construct knowledge applicable to the classroom practice. The evaluations made in the post-monitoring conference are revealed by PTs' reflective practice and contribute to the development of the prospective teachers. For example, Arrendondo and Rucinski (1998) argue that a "support/challenge" interaction pattern rather than a directive style in conferences contributes to the mentors' and prospective teachers' reflective thinking.

Studies on practicum (Acheson & Gall, 1997; 2003; Pajak, 2000) mention three learning cycles for PTs; first one is the pre-course conferences, which aimed to provide opportunities of conversations between the cooperative teacher (CT) and PT to help inexperienced PTs with lesson planning. The other learning opportunity is during the lessons where PTs observe the CTs' teaching process in their classrooms (Grosser-Clarkson & Neel, 2019). Lastly, post-course conferences where PTs make reflections on their performance and feedback is given by CTs and the

university supervisor (Hoffman et al., 2015; Staub, 2004). Reflection is an essential focus of teacher education (Marcos et al., 2009) because it can improve the quality of teaching and is vital for professional development (Darling-Hammond, 2014). Along with the reflection and feedback from CTs and the university supervisor, in the conferences there is another important participant, the peers. Peer evaluation or peer coaching puts another dimension to the evaluation. This supplementary form of assistance to coaching, mentoring, and supervision can be defined as peer coaching. Peer coaching has emerged to reduce the workload of CTs and supervisors during the practice (Kreis, 2019). During peer coaching, students of similar level of competence can exchange and discuss their ideas for planning a lesson in a pre-course conference or what they have observed during the lesson in a post-course conference.

In the post-course conferences, peers, CTs, and the university supervisor evaluate the prospective teacher in the context of some basic elements for the course they teach, while the prospective teachers reveal their reflective observations. These meetings aim to improve the prospective teachers' upcoming lectures and teaching actions. The contents of the evaluations made in the meetings can be instructive, guiding, or just evaluation-oriented. Therefore, each of the conferences that can be held in more than one variety provides different gains to the prospective teachers. An examination of the content and process of post-course conferences may be useful in understanding how this development potential of supervision can be realized.

In this study, the evaluation process is examined under two contexts, type and content of the post-course conferences. Based on these two context of the evaluation process the leading question is as follows: "What is the context of the post-course conferences regarding the mathematics prospective teachers?" In addition to this main problem, a sub-problem will also be examined since it will also be evaluated how there is a change in the context of the post-course conferences held after the lectures of the prospective teachers: What are the overall differences between the first and second post-conferences of the prospective teachers based on the types and content of the two conferences?

Conceptual Framework

The conferences in which prospective teachers' educational practices evaluated are discussed in two different scopes in the literature: "type of conferences" and "content of conferences". These two scopes will constitute the conceptual framework of the study.

The type of conferences is divided into 6 categories in the literature (Blanton et al., 2001; Fernández & Erbilgin, 2009; Erbilgin, 2014; Tsui et al., 2001). The first type is called "Questioning". These conversations are based on asking questions that will help the prospective teachers self-evaluate the lecture. The second one is the "Assessment" category. The focus of this category is that the prospective teachers make positive and negative comments about the teaching actions. "Explaining" is the third category. It covers the explanations and interpretations made by the meeting participants regarding the teaching processes of the prospective teachers. The fourth category is called "Describing". These are the speeches that cover the direct observations made regarding the teaching processes of the prospective teachers. "Suggestion" is another category. It includes the instructional advice given by the meeting participants to the prospective teachers. Finally, there is the category of "Emotional Talk". The content of this

category includes the affective discourse of the prospective teachers during the course towards their students, themselves and their future profession.

The content of the meeting speeches was also examined in 6 categories. The first of these is called "General Pedagogy". In this category, situations such as providing motivation, effective use of assessment and evaluation methods, management of group work, calling students to the board and their functioning on the board, processes of using materials, and ensuring students' participation in effective lessons were discussed and evaluated. The second category is "Mathematics Pedagogy". In this category, speeches were made based on the use of mathematical misconceptions, teaching approaches to mathematics, materials, and approaches that facilitate mathematics learning. The third category is called "Mathematical Knowledge". In these conversations, various situations where mathematical knowledge is used are discussed. "Classroom management" is another category. Speeches in this category are also meeting speeches where concepts such as discipline, effective use of time, class management, control of useful noise during the activity, and dealing with students individually are discussed. The fifth category is called "Teacher-student relations". In these speeches, concepts such as dealing with the emotional development of students, establishing rapport with students and addressing them by their names, being able to talk in and out of class, and the teacher getting to know their students were included. The last category is "General Teacher Growth". In these speeches, such issues are discussed as determining the roles of the teacher, the professional development comments of the prospective teachers towards themselves, realizing when they should use which strategy, revealing their development, determining their feelings about being a teacher and the aspects they should develop.

Method

Research Design

This research was designed using the qualitative research paradigm. In this research, the case study design was used to examine the content of the conferences where the prospective teachers' performed teaching in the real classroom. The situation revealed in the case study was determined as "post-course conferences" held after the lectures of the prospective teachers. Therefore, since there are more than one conference and each one is compared with each other, the multiple holistic case study design was preferred (Yıldırım & Şimşek, 2003). The unit of analysis is the observations made by the participants of the conferences (prospective teacher's peer/ critical peer, cooperative teacher, prospective themselves and the university supervisor) regarding the prospective teachers' teaching actions.

Participants

Prospective mathematics teachers enrolled in the "Teaching Practicum" course in the 2nd semester of their 4th year to complete a series of assignments (e.g., observing classes, learning school policies and procedures) in elementary schools. In the academic year of 2018, 11 prospective teachers (2 males and 9 females coded as PT) undertook the "Teaching Practicum" course and they cooperated with two mathematics teachers (a male-MT and a female WT) for 14 weeks.

The prospective teachers are expected to come together with their university supervisors to discuss their observations and turn in their field notes and assignments. The internship is a two-semester experience, and elementary prospective teachers are enrolled in two practical courses in their fourth year. Student teachers prepare and teach lessons at 5th through 8th-grade levels under the supervision of their cooperating teachers for 12 weeks. Each week, student teachers meet with their university supervisors to discuss their teaching experiences and reflect on their teaching. At the end of the semester, they should complete 4 individual teaching sessions in the school by themselves and their CT, colleagues and university supervisor observe their teaching.

Data Analysis

Audio recordings of 26 interviews of 14 prospective teachers were collected for the study, however, as each prospective teacher was expected to have 2 interviews and yet the 3 interviews of prospective teachers were incomplete, so they could not be included in the data set. As a result, the voice recordings of 22 interviews of 11 prospective teachers constitutes the final data set. The transcriptions of the interviews were analyzed using the theoretical frameworks of the conference content and conference type (Fernández & Erbilgin, 2009; Erbilgin, 2014).

In coding the conversational segments that included the communication of feedback, the authors adopted the notion of "idea unit", which contained a distinguishable idea, expressed in a phrase, a sentence or a number of sentences (Tsui et al, 2001). Each idea unit was then coded according to (1) the content; and (2) the nature of feedback.

The transcribed audio recordings of the meetings with content analysis (Yıldırım & Şimşek, 2003) were first coded by 2 researchers. 14 meeting transcripts randomly selected and coded by all researchers. The consistency between coders was calculated as 73%, a complete consensus was reached with the evaluations made on each data coded differently (Miles & Huberman, 1994). In addition, the analysis of one of the transcripts was examined with the prospective teacher, who is the subject of the conversation, and the harmony between his thoughts on the situation and the consistency of the codes given to the situation was also examined (Miles & Huberman, 1994). Table 1 is summarized the type and content of the speeches.

For confirmability, opinions were obtained from prospective teachers participating in the evaluation meeting on the results and their feedback on the categorizations was requested. There was no different criticism of the categories made in these feedbacks and the evaluations made by the researchers were approved. Since the analyses were based on the conceptual framework used in the studies and were supported by direct quotations from the speeches, dependability and transferability of the study were provided.

Table 1
Scopes of the Evaluation Conference

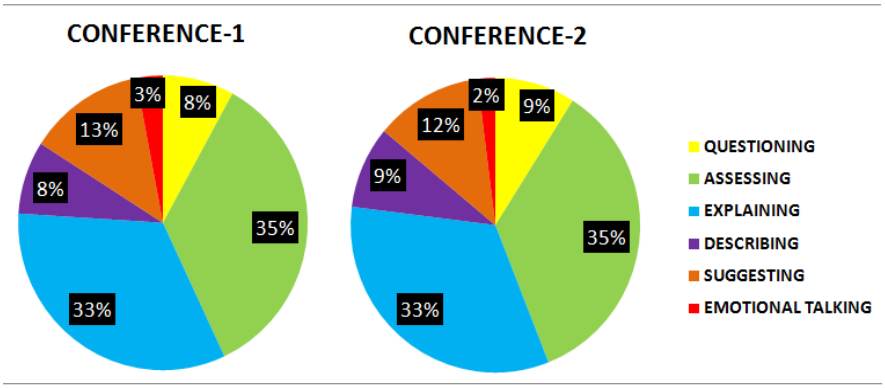
Scopes of evaluation conferences	Sub-dimensions of scopes	Examples from Speeches
Type of conference (nature of the feedback)	Questioning	Is it the questioning of the prospective teacher that leads to the dual conversations? Are the questions open-ended? Are they yes-no questions? The student made a mistake here. What would you do to fix it? You didn't use your time well, where do you think you went wrong?
	Assessment	Positive-negative comments were made to the prospective teacher. You were very good compared to your previous lecture. The introduction phase of the course was very successful. The transition between the materials was very nice.
	Explaining	Prospective teachers express themselves regarding their teaching processes in the course, and observers express their ideas according to their situation in the course. There was a mix-up in the classroom because I couldn't give the instructions properly. I have not tried the material before because I wanted to do it with the students etc.
	Describing	The prospective teachers describe themselves or the observers describe the work of the prospective teachers. Direct observations; you could not use the smartboard effectively, you asked so and so questions, the student gave so and so answers, etc.
	Suggesting	Advice on the prospective teachers' work and future lectures. All suggestions are neither directive nor non-directive. You could have used a little more visual when you were talking about it. During the activity, you could have waited for the students to do it and then shown it how it's done yourself.
	Emotional Talking	The feelings of the prospective teachers during the lesson. I was so nervous. I was so excited. This behavior of the students made me very happy, etc.
Content of the conference	General Pedagogy	You couldn't obtain the motivation of the kids. Group work or direct instruction, board use, to what extent students can or cannot participate in the lesson, should they be called to the board or not, group work, management, the process of using materials, students' participation in the lesson. Participation of students in the course, assessment and evaluation.
	Mathematics Pedagogy	They'd understand better if you did that. ~~Misconception~~
	Classroom management	Did their sense of discipline were too relaxed or too harsh for their classroom? Did the kids listen to the lecture? Did they walk around a lot? Classroom noise, usage of time.
	Mathematical Knowledge	Content Knowledge -For example, when you had it done according to the y-axis (a, b), but you said (a, b) again in its symmetry according to the x-axis. Two points cannot have the same name in the same coordinate system. -You asked about the surfaces. You called the bases, bases You called side surfaces, surfaces. Then when you asked the children about how they relate to each other, you replied. The surface is bigger than the base. That was wrong.
	Teacher-Student Relations	There is emotional and more individual content. Name addressing, extracurricular conversations, proximity to children, pre-class conversation, one to one teacher-student relationship. They express sentimental things about students. I explained it, but they couldn't do it (can be considered as positive and negative comments of the teacher about his students.) Including their pros and cons. I tried so hard, but the kids couldn't communicate with me. They didn't like me.
	General Teacher Growth	Which teaching strategy should I have used?, I should've only talked about math., What are the roles of teachers?, A teacher does this and that., How does it feel to be a teacher?, How does the teacher develop and what should he/she do?, You'll be a better teacher if you do all this.

Results

In this study, the conferences attended by primary school mathematics prospective teachers at the end of their lectures in internship schools were examined and these examinations were detailed under two main headings as "Type of Conference" and "Content of conference". These two main headings were divided into six subheadings and the changes observed between the two evaluation conferences held for each prospective teacher were revealed.

Types of Communications in Post-Course Conference

In Graph 1 below, the scope of the speeches in both evaluation conferences is given in terms of their types. When the graphs are examined, it is seen that there is a high rate of parallelism between the percentages showing the types of 1st and 2nd conferences.



Graph1. Percentage Comparison of Types of Meeting Talks

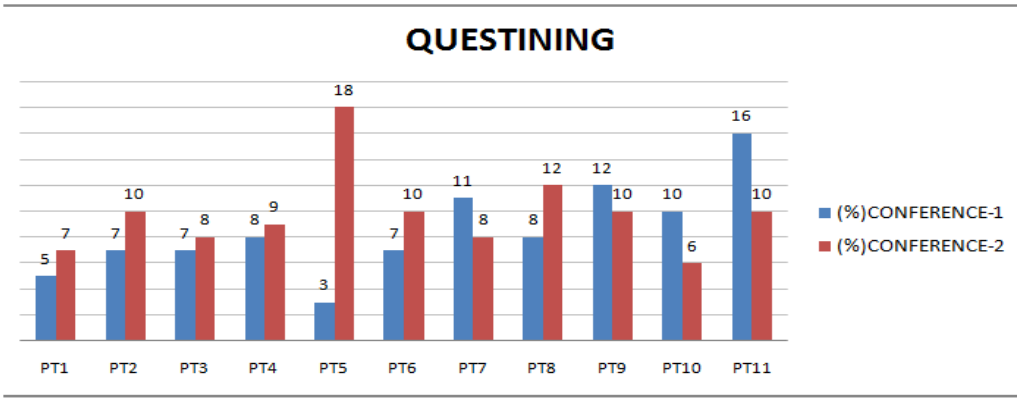
In both meetings, it is seen that the speeches belonging to the assessment category are more dominant with 35% compared to other categories, and the least talked category is 3% emotional talking in the first and 2% emotional talking in the second respectively. It can be said that the types of speech of the questioning and description categories are 8% and 9%, respectively, with a very small difference in both meetings.

When we compare these two conferences, it is observed that the percentages of the categories of explaining (33%) and assessing (35%) in the second conference (see Graph 1: Conference 2-C2) do not vary compared to the first one (see Graph 1: Conference 1-C1). Suggestion category was 13% for Conference 1, 12% for Conference 2, 3% for emotional speech category Conference 1, and 2% for Conference 2. Speeches belonging to the definition and inquiry categories also experienced an increase from 8% to 9% in the percentages included in Conference 1 and Conference 2. The fact that prospective teachers inspect themselves in their second conference and clearly reveal the matters in the classroom can be shown as a reason for this increase.

In general, to understand how the types of speech in both conferences changed in the context of the participants, the differences of each participant in the categories of speech types were examined. These examinations are detailed below.

Questioning: In the speeches in the post-course conferences, questions that will enable the prospective teachers to examine the lecture and how they can improve the lecture were coded as "questioning". Considering the ratios of

the meeting speeches of this code (see Graph 1- Conference1), 8% of the first conference and 9% of the second conference were mentioned at a below-average intensity. Graph 2, in which these speeches are compared in the context of two meetings and prospective teachers, shows the intensity of the questioning-based content speeches of each prospective teachers in the first and last conferences.



Graph 2. Comparison of Conversations of the Questioning Category

When the graph is examined, it is seen that the number of questionings of 7 prospective teachers in the second meeting increased compared to the first meeting, and the conversations of 4 prospective teachers about the questions were more frequent in their first meetings. In the second set of conferences, it can be said that this was caused by the increase in the questions of the prospective teacher and the teachers' starting to share the reflective thoughts of the prospective teachers in addition to the university supervisor and their peers.

In the second post-course conference, in which PT4 asks students to create a right square prism with unit cubes, the conversation between him and his peer and the cooperative teacher can be an example of this situation:

> Peer: Time was limited, but I expected you to do conversions. You could have asked a question from there.
>
> PT2: Should I have a 180-degree rotation?
>
> Cooperative Teacher: You could have done that, but what you really needed to do was to give the details in meters and ask for the volume in cubic decimeters.

However, while the questions about how to improve the teaching of prospective teachers were more frequent in the first conference, it was observed that the questions of the prospective teachers about their actions or failures in teaching and learning processes during the second conferences were more frequent. This shows that there are also changes in the types of questioning of prospective teachers themselves.

The 1st and 2nd conference's speech of PT5 is also an example of this change:

1. Meeting:

PT5: Because they did not look at the full activity sheet, some children thought that the third question was not asked while solving the questions step by step.
University supervisor: Nice catch. What were you supposed to do then?

2. Meeting:

University supervisor: What was the goal of this course? Was it solving questions or teaching problem-solving?
PT5: Actually, the goal was to teach problem-solving, but I thought I could also ask some questions.

PT5: When I first had the second question done and questioned why you did so, they directly answered the third question. Therefore, it would be more accurate to look at the questions until the third question.

The majority of the questionings in the conferences consisted of open-ended questions. It was revealed that most of these were proposed by the university supervisor among the conference participants. However, it was determined that the conference participants other than the university supervisor mostly asked short-answer and yes/no questions during the conversations.

A sample of open-ended questions of questioning category was directed by the university supervisor to PT11 in the first conference:

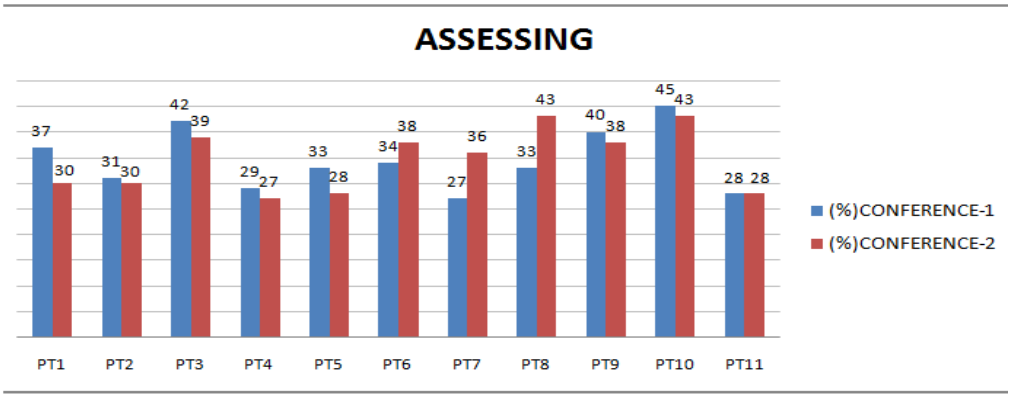
> University supervisor: Could you do self assessment? Where do you think you made a mistake besides time management?

However, in the post-course conference of PT8 after 5th graders lesson, a question by the cooperative teacher that requires a yes/no answer is asked like this:

> Cooperative teacher: There was a lot of noise in the classroom, could you speak loudly to make everyone sit down?

In the second set of conferences, it was seen that the self-analysis of the prospective teachers increased, personal questions about their improvements in the first conferences were examined about the teaching and learning processes in the second ones, and generally, open-ended questions were asked by the university supervisor, and the yes/no questions were also asked by the cooperative teacher, and they were explained with the examples above.

Assessing: Positive and negative comments from the conferences about the prospective teacher's teaching actions are coded as "Assessing". The Assessing category has the highest percentage in both two conferences with 35%. The conversations were examined and interpreted by comparing them in the context of prospective teachers in Graph 3. Looking at the chart, it can be said that 7 of the prospective teachers had more frequently mentioned the assessing in the first conference and 4 in the second conference. Nevertheless, there is not much difference in the number of evaluative speeches in the two meetings. In this category, it can be said that the comments about the first lectures of the prospective teachers were negative, and these comments generally changed more positively in the second post-course conference. In other words, while prospective teachers assessed themselves negatively in their first conference or even though the conversations made within the scope of the asessing were generally negative, positive assessments were made in the second conferences indicating that more positive and in-class teaching actions improved.



Graph 3 Comparison of Conversations of the Assessing Category

For example, while there were more negative assessments at the first conference of PT8, there were more positive assessments at the second meeting of PT8. This situation is also seen in the following sample.

Conference 1:

University supervisor: You could not integrate into the class. But you are a part of that class. You need to feel and hear everything that goes on in the classroom. For example, if two children hurt each other while fighting in the back row... You need to be able to feel it. You turned your back when you were using the board. You shouldn't do that. You should always write on the board while controlling the classroom.

Conference 2:

Peer: I think it was a much better lesson than your previous lesson. Classroom management was especially good. You were able to include all the students in the course. The students wanted to attend the class. The engage stage of the lesson was important, it went really well. And you did a great job managing the level of your voice.

At the same time, the positive comments in the second set of meetings were generally expressed by comparing them with the previous lesson. For example, the positive comments on the second lecture of PT3 were stated by the cooperative teacher by comparing it with the previous lecture:

Conference 1:

University supervisor: The biggest problem, you are aware of this; the instructions of the activities. Also, you give so much closed feedback to the children while walking between groups, that is, "Read" and "Look". However, the child is struggling there, asking questions to you... You need to give me more useful clues in your answers. You didn't give any useful clue.

Conference 2:

Cooperative teacher: You have a rising chart, that's a good thing. I thought your classroom management was a little better this time.

It was observed that the majority of the assessments were on the mathematical pedagogy knowledge and classroom management of prospective teachers. In this case, it can be said that prospective teachers especially have problems with these two issues and conversations are intensified in these two contexts. Although evaluations of the prospective teacher's subject matter knowledge have been made from time to time, it is possible to say that the number of teachers is low compared to the other two contexts.

The assessment of the university supervisor on mathematics pedagogy in the second post-course conference in which PT9 conducted drawing a linear pair angle activity using a geometry board is as follows:

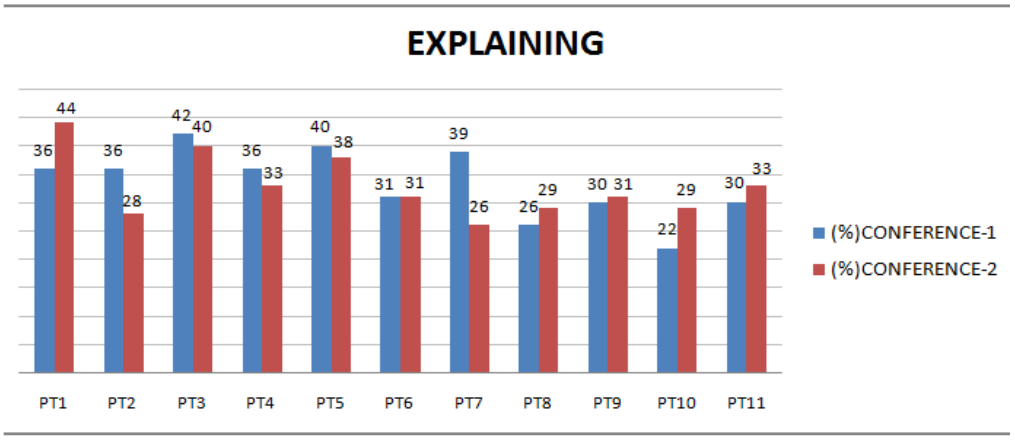
> University supervisor: You also switched from geometry board to dotted paper. That was a good transition. But you measured with the protractor only yourself. However, it would be more efficient if every child had a protractor and made measurements themselves.

The assessment made by the university supervisor and the cooperative teacher on classroom management in the first lecture of PT10 is as follows:

> University supervisor: The purpose of our activity is to allow children to study at different paces, but when the children ask "Shall we move on to the other question?" you answered, "wait". That was very wrong.
> Cooperative teacher: Students should continue to do the questions at their own pace.
> University supervisor: Absolutely. Students who are fast learners do not have to wait for those that are not, and some students do not have to catch up with the fast learners. That's the beauty of using group activity in the classroom.

While the comments under the assessment category were generally negative in the first conferences, they were replaced by positive comments in the second ones. It is seen that this transition occurred because of the comparisons between the first and second teaching sessions. It can be said that the reason for the increase in positive assessments is that the prospective teachers are trying to react to the negative comments they received in their first teaching practice.

Explaining: In the content of the conference, the examinations made in this category, which covers the explanations and interpretations of the teaching processes of the prospective teachers, were coded as "Explanation". Considering the meeting as a whole, the explanation category is one of the most observed categories with 33% in both meetings. The comparison of each prospective teacher in the context of two conferences is given in Graph 4.



Graph 4. Comparison of Conversations of the Explanation Category

When the graph is examined, it is seen that there is not much difference between the two conferences. While the number of mentions of the explanation of one prospective teacher in both conferences showed equal distribution, 5

prospective teachers mentioned this category more frequently in the first conference and the other 5 prospective teachers in the second one. It was observed that most of the explanations were made by the prospective teacher among the conference participants. It can be said that this is also due to the prospective teacher's explanations about the questions of the other participants of the conferences. For example, in the first conference of PT3, his explanation of a situation during the lesson is as follows:

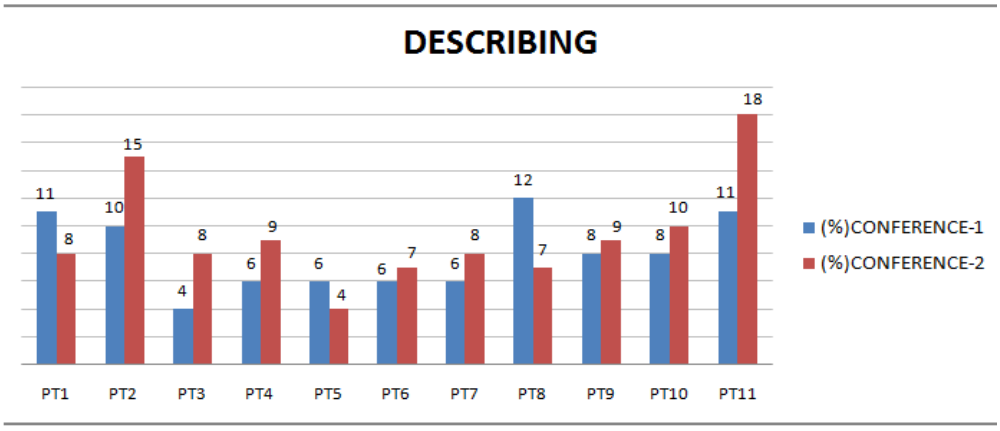
> PT3: Since I could not give the instructions properly at the beginning, the whole class was confused, they could understand what I mean. So I went around the classroom to explain each group separately. I've already kept the beginning short to get straight to the event, to catch up on time.

PT6's explanation for the questions by the university supervisor at the 2nd conference is given below.

> University supervisor: You were unprepared for using materials. You could have prepared at home, why didn't you do it?
> PT6: I wanted to do it with them. I wanted to give you the impression that I was doing it with you. But I think it would have been better if I had prepared beforehand.

There is no difference in the explanation category between the meetings. It can be said that this is an expected situation since prospective teachers constantly try to explain the inquiries directed at them.

Describing: Conversations covering direct observations about prospective teachers' teaching processes are coded as describing. Describing category were handled very little in both conferences with 8% and 9%, respectively. The conferences involve describing conversations are given in Graph 5.



Graph 5. Comparison of Conversations of the Describing Category

When both conferences are compared, it can be seen that only 3 prospective teachers have describing percentages are more than the second one. The other prospective teachers used more describing talking style in their second conferences than the first one. Most of the prospective teachers were keen to describe the teaching process of their practicum in the conferences. These descriptions are getting more through the conferences.

For example, a situation observed by a peer during the course of the PT10 in which he tried to teach "finding out the volume of a cylinder by the idea of using surface area of the circle with the same centers."

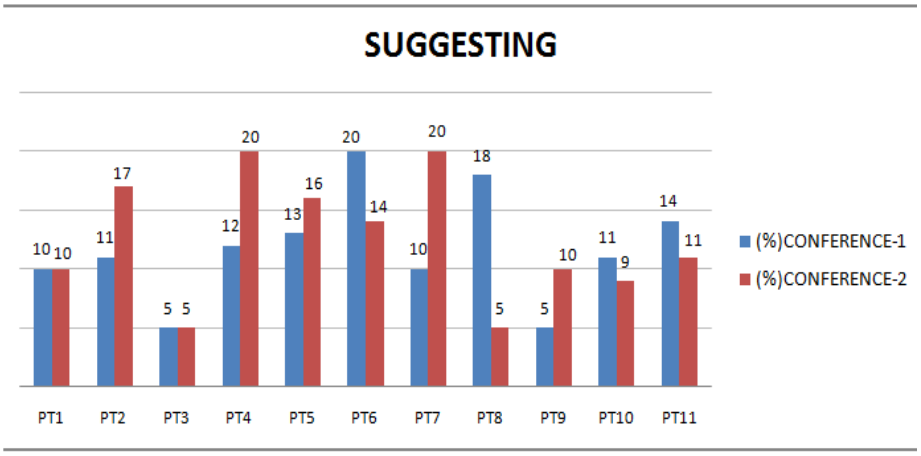
> Peer: During lesson you asked a question to a student "you add base and lateral areas while finding the surface area of the cylinder, why did you do it?" and the student explained as "Teacher, because a cylinder is formed with the sum of all."

Here, an observation made by the peer of the cooperative teacher PT1 about the teaching session and they discussed this observation and explanation at the post-course conference. In this observation, the Cooperative teacher asks the prospective teacher to emphasize the definition and content of the measurement units equally:

> Cooperative teacher: In the courses you study the centimeter topic a lot, but you did not examine the meter particularly.

The definition category has the almost the same rates in both conferences (C1:8%; C2:9%) and it is the least mentioned category. The reason behind this can be that the participants collected their observations during the course not directly what is happening at that moment but rather they prefer to add their comments on the situation that they observed.

Suggesting: The instructional advices are given by the participants of the conferences to the prospective teacher was coded as "Suggestion". Considering the ratios of the suggestion category, it is seen that 13% in the first conference and 12% in the second conference were discussed. The comparison of two conferences on prospective teachers' teaching practice is given in Graph6.



Graph 6. Comparison of Conversations of the Suggestion Category

Looking at the chart, it is seen that 4 of the prospective teachers had more suggestive conversations in the first and 5 in the second conference meeting. There is no change in percentage between the two conferences for the 2 prospective teachers. In the category of suggestions that emerged most of the time while university supervisor propouse some technical advise and strategies for the teaching situation to the prospective teacher. Although these are the suggestions for alternative strategies instead of the methods and strategies they use in their teaching processes, they also include some general tips to help them become better teachers in the future.

The suggestions of the cooperative teacher about the changes that PT8 can make regarding the course are given below.

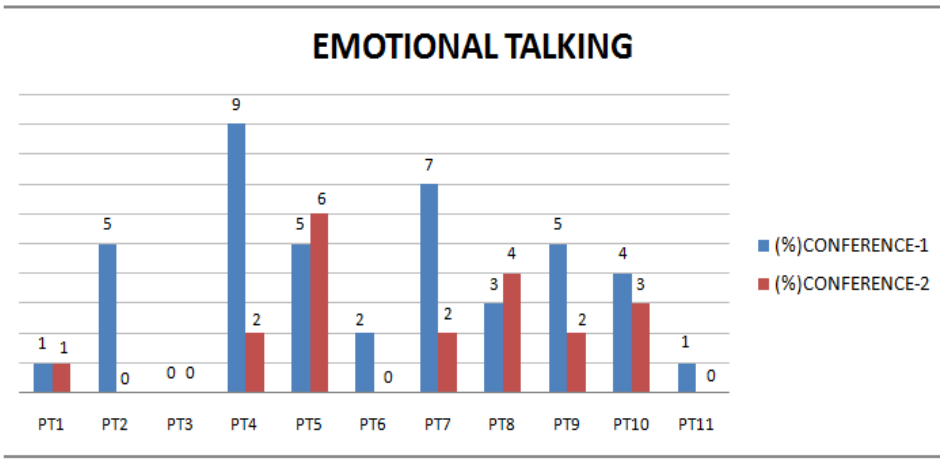
> Cooperative teacher: I think the introduction was a little short. You could have spent more time on it. You could have attracted the students by asking "whose father has a real estate agency?. Then he started to the activity immediately, and said that everyone should do it themselves first and then we were doing together. But there was a conceptual gap there. Maybe he could make one student read the first step out loud and check whether everybody understend the first step of the activity.

Similarly, a suggestion was made by the cooperative teacher to PT6 to increase the motivation of the classroom at the beginning of the lesson.

> Cooperative teacher: I wish it was more visual. I'd like a 1–2-minutes video at the stage of engage in the lesson. You mentioned the trains in Japan. You could have put them there as visually. You could have used the smart board. There are some very good videos on this subject. They get the attention of the students really well.

In both conferences, the speeches belonging to the suggestion category emerged as the prospective teachers were advised by the meeting participants about the lesson they taught and their classroom actions and how to improve their relations with the students in the future. It is seen that these suggestions are frequently made by the university supervisor.

Emotional Talking: In the content of the conferences, the affective discourses of the prospective teacher towards their students, himself/herself and his/her future profession were coded as "Emotional Speaking". Emotional speech is the least mentioned category of two conferences with 3% and 2%, respectively. The comparison of the speeches belonging to this category in the context of prospective teachers for both conferences is given in Graph 7.



Graph 7. Comparison of Conversations of the Emotional Talking Category

When the Graph is examined, it is seen that there are more emotional talking appears in the first conference of 6 prospective teachers and for only 2 prospective teachers in the second conference emotional talking appears more. At the same time, for PT6 and PT11 there was no emotional talking at the second conference and no emotional talking of PT3 for both conferences. We can attribute this situation to the fact that prospective teachers mostly focused on

their feelings towards students in their first lectures, were very excited and frequently expressed their emotional attachment to their profession. PT4 expressed the emotion on poor classroom management as;

> PT4: Some students correctly use letters for naming the point in the coordinate system, but some showed the coordinates incorrectly. I couldn't control all of them. I noticed the mistakes, but since I had been checking the time continuously it made me anxious and excited.

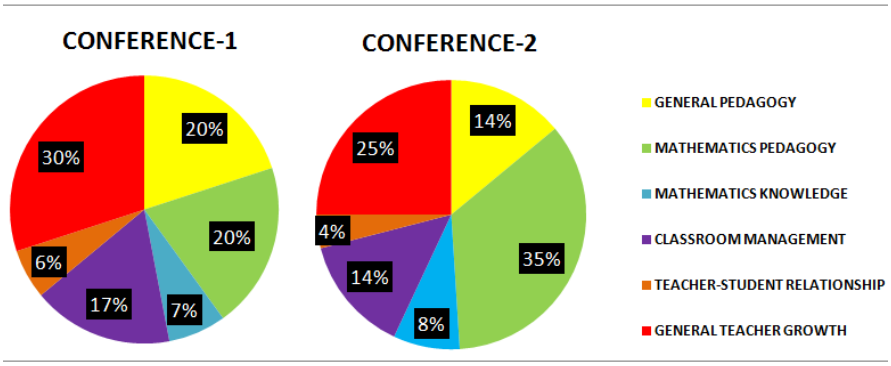
Here, too, a situation caused by the excitement experienced by PT5 was mentioned.

> Cooperative Teacher: There is nothing very different from the last time you taught, you started very anxiously this time. So, this unsatisfied lesson happened because of these feelings of yours. You know, if you were a little more comfortable, if you had a little more control, everything could have gone well.

The emotional talking category has the least percentage among others. It can be said that the reason why prospective teachers talk less in the second conferences than in the first one is that they get used to the classroom environment and their students and focus on the course process rather than their feelings.

Types of content in post-course conferences

When the post-course conferences were examined, 6 topics emerged based on the content. How these topics change in percentage in both conferences is shown in the graph below.



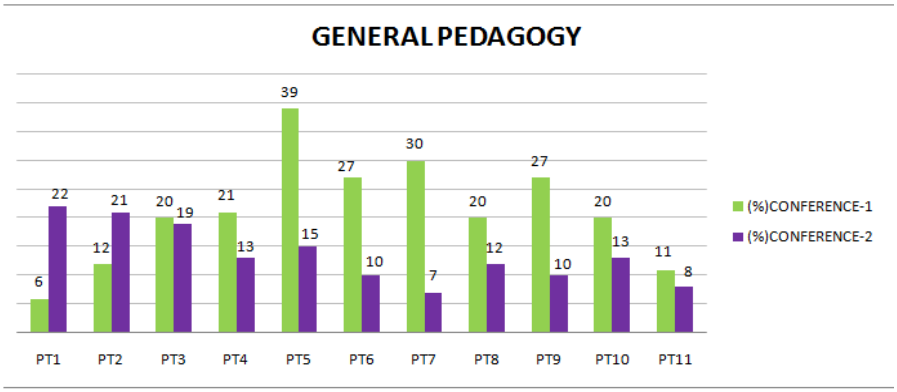
Graph 8. Percentage Comparison of the Contents of Conferences

Considering the whole percentages of these two conferences; two categories appears very distinctive among others. The General Teacher Growth category were quite frequent in the first conference with 30%, and the Mathematical Pedagogy category has a very high percentage with 35% in the second conference. It is seen that the least mentioned content emerged as Teacher-Student Relationship with 6% and 4%, in the conferences respectively. When these two conferences are compared, it is seen that there is a decrease in the percentage of the general teacher growth, general pedagogy, classroom management and teacher-student relationship categories, and there is an increase in the categories of mathematics knowledge and mathematics pedagogy. At the same time, although the General Pedagogy and Mathematics Pedagogy categories had at the same rate (20%) in the first conference, the rate of the Mathematics Pedagogy category increased to 35% in the second conference, while the rate of general

pedagogy decreased to14% compared to the first conference. This should be considered as a sign that prospective teachers do not need to talk about general pedagogy as often as they used to do. Instead their frequency of talking about mathematics education is increased and they concentrated on their pedagogical content knowledge.

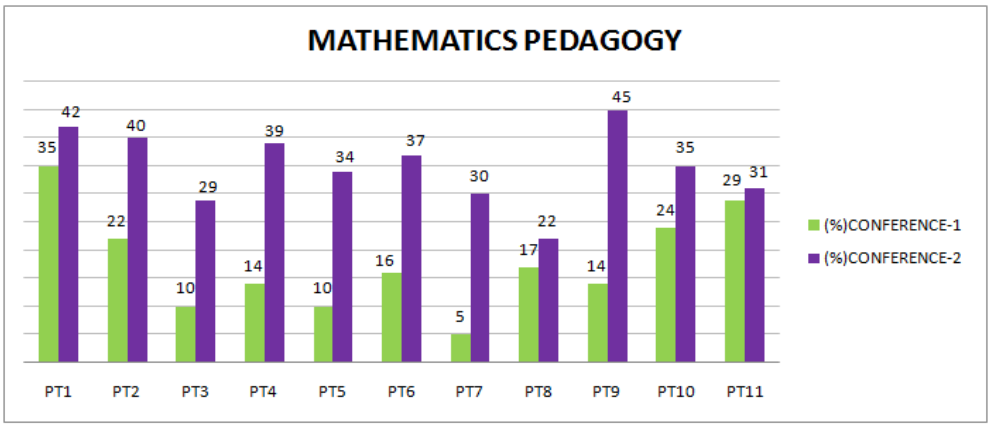
The details of the 6 topics of conferences in order to content are examined below in detail.

General pedagogy and pedagogy of mathematics: Conversations including concepts such as motivating students, using assessment and evaluation methods effectively, managing group work, tasking students on the board and managing the operations on the board, using materials, and ensuring effective participation of students in the lesson were coded as general pedagogy. When the content ratios of the general pedagogy category were examined, 20% of observed for the first conference and 14% for the second conference. The changing the rates between two conferences of prospective teachers is seen in more detail in the Graph below.



Graph 9. Comparison of Conversations of the General Pedagogy Category

When the graph is examined, while general pedagogy were mentioned more in the first conferences of 9 prospective teachers, only for two prospective teachers more talking were observed for the second conferences. Therefore the general rate is decreases for this category from the first conferences to the second one. On the other hand, in Graph 10 pedagogical content knowledge which is named as the mathematics pedagogy is observed more in the second conferences. This means that mathematics pedagogy talking is increased from first to second conferences. In the mathematics pedagogy, mathematical misconceptions and teaching approaches to mathematics categories, conversations based on the use of materials and approaches that facilitate mathematics learning were examined.



Graph 10. Comparison of Conversations of the Mathematics Pedagogy Category

In the first conference of PT3, while the university supervisor commented on the prospective teacher's deficiencies in general pedagogy, in the second meeting these comments were replaced by the comments on mathematics pedagogy.

1. Meeting:

University supervisor: This is a very complicated instructions for a fifth-grade student. When you say "Divide twelve identical pieces into three", the children already know that it will be four. However, you said that "divide the items into three such that each group has four items" In this sentence there are two unknowns; what is group number what is the number of items involved in each group.

2. Meeting:

University supervisor: The using three symbols was very nice. You didn't emphasize that there are three couples there…There was a lot of topics that you can make clear, but you skip and passed.

Likewise, in the first conference of PT10, while the conversations about general pedagogy were more frequent than the mathematics pedagogy, in the second conference, the talking focused more on mathematics pedagogy.

1st Conference:

University supervisor: Why don't you let them help each other? Everyone tries to do it alone. Why are you trying to do it all by yourself? After all, peers can support each other. There's such a thing as group work.

2nd Conference:

The Peer: I think the biggest mistake of you is asking such question; "Name triangle ABC." When naming triangles you said that it doesn't matter which side comes to the bottom as if it doesn't matter. This is very wrong and even the girl sitting in the middle got it wrong because you misled it..

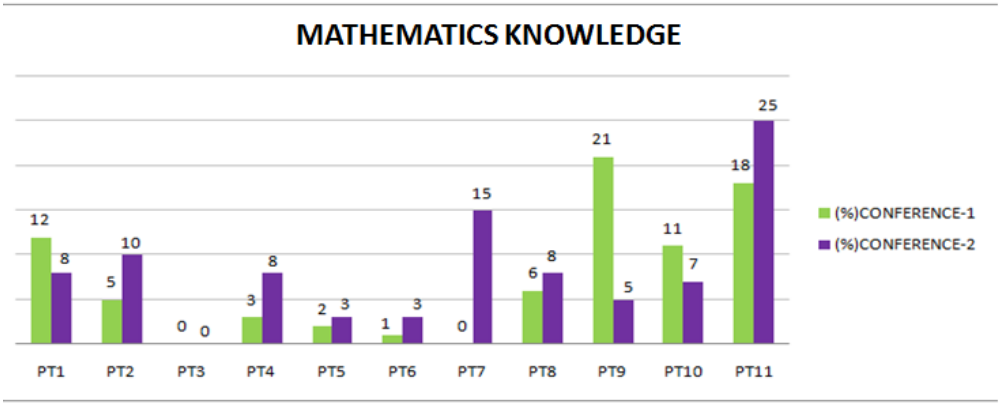
The differences between the first and second conferences can be interpreted as while the prospective teachers were spending more time in classrooms they getting used to management issues and they did not feel anxious about students or in other words general pedagogy. However, instead they realized that their poor pedagogical content knowledge and lack of different strategies of teaching mathematics.

Mathematical Knowledge: If mathematics and mathematical knowledge are mentioned directly in the conferences, these are coded as mathematical knowledge. Considering the both conferences with 7% and 8% this

category observed very rare. The comparison of the frequency of talking about this category of each prospective teacher for two categories is shown in Graph11.

When the graph is examined, it is seen that for 3 prospective teachers mathematical content was mentioned more in the first conference, while for the other 7 PTs second conference involves more mathematical knowledge. On the other hand, in the two conferences of PT3 there was no mathematical knowledge based talking observed.

From this point of view, it can be said that prospective teachers did not have any problems in their lessons about their mathematics knowledge. Therefore in the conferences not that much talking about the subject matter knowledge.



Graph 11. Comparison of Conversations of the Mathematics Pedagogy Category

However, it was seen that subject matter knowledge was discussed by the university supervisor and the prospective teacher was warned in a few times in the conferences. This can be showed the critique of university supervisor to PT11 in the post-course conference.

> University supervisor: For example, when you take the symmetry of the point you called the new points as A', B', then you get another symmetry by the x axis in the same plane you called these points again A', B' . You gave four different points with the same name. These are scientific mistakes.

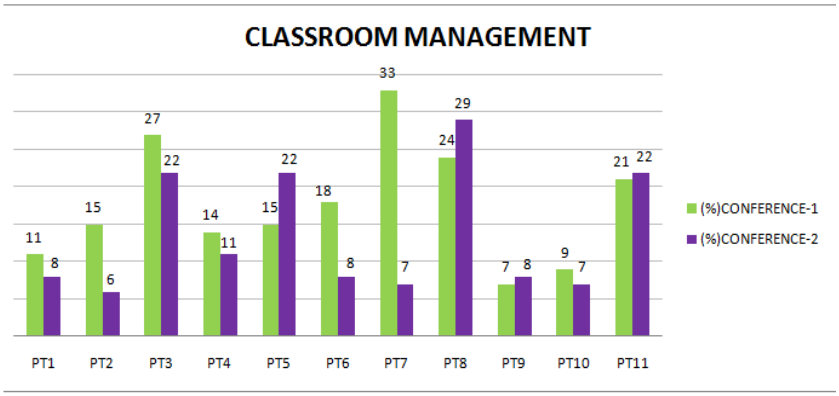
Similarly, in the post-course conference of PT2, a mathematical mistake was expressed by the peer of the prospective teacher as follows.

> The Peer: while you are examining the solids faces you said that the surface is bigger than the faces of the solid but this was wrong.

Among the conferences Mathematics Knowledge category were less discussed than others. This may be because of the prospective teachers' general mathematical knowledge is sufficient and they do not have mathematical problems during the teaching in the classroom.

Classroom Management: In the conferences the talking about disciplining the students in the classroom, effective time management, control of useful noise during the activities, and dealing with students individually are discussed and coded as classroom management. While this category has 17% in the first conferences, it was decreased to 14% in the second conferences. The rates of each of the prospective teachers in two conferences are shown in detail in Graph 12.

When the graph is examined, it is seen that although classroom management observed mostly in the first conferences for 7 prospective teachers, only 4 prospective teachers the situation is vice versa. The fact that the prospective teachers frequently talk about classroom management in the first conferences because of their lack of classroom experiences. The most underlined concept in classroom management by the prospective teachers was not using time effectively. This subject caused prospective teachers to criticize themselves and to be criticized by the conference participants.



Graph 12. Comparison of Conversations of the Classroom Management Category

There were also topics about paying attention to the students individually both a strong properties and poor classroom management skill. An example of PT1's explanation:

> University supervisor: You did not observe left part of the class, you completely missed that part. You just interacted with those 3 or 4 students not all classroom.

An example of a peer for PT5 lesson in the post-course conference as follows:

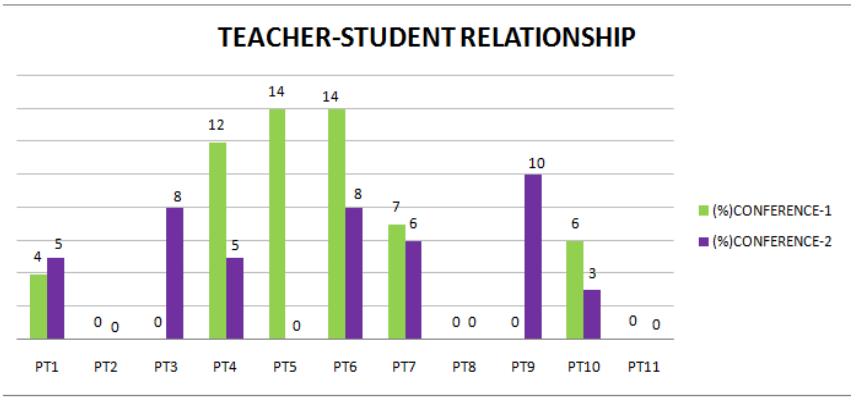
> The Peer: The reason that she couldn't completed the lesson in time was because she did not maintain class control. As far as I could see in the classroom, 4 or 5 people paid attention, and the rest talked among themselves.

Regarding the effective use of time, the university supervisor emphasized conference meeting for PT9 as;

> University supervisor: You actually used the time very well and you completed your evaluation stage and finished lesson on time.

Although the concept of classroom management is an area where prospective teachers are very anxious and often criticize themselves, it has not been discussed as much as it is thought in the conferences in general. Nevertheless, among the mentioned topics time management and not being able to control the whole class were emphasize frequently.

Teacher-Student Relationship: Although it seems like a concept similar to the classroom management issues, in the discussions, the concepts such as dealing with the emotional development of the students, establishing rapport with the students and addressing them by their names, being able to talk in and out of class, and acknowledging the students are coded as teacher-student relationship. The intensity of the conferences where these concepts are discussed has the lowest rate among all contents and was determined as 6% in the first meetings and 4% in the second. Graph 13 shows how frequently each of the 11 prospective teachers mentioned these concepts in both conferences.



Graph 13. Comparison of Conversations of the Teacher-Student Relationship Category

When the graph is examined, it can be seen that there was no mentions in any of the conferences of 2 prospective teachers and these concepts were not mentioned in the first meeting between 2 prospective teachers. In addition, while the prospective teacher who has the evaluation meeting where the discussions in this category are the most common among the first meetings is PT5, it is seen that no discussions were made in this context at the second meeting of the same prospective teacher.

Based on all these situations, it can be said that actions such as extracurricular conversations with students and creating a sense of connection to students are not seen as important by prospective teachers compared to other subjects. For example, by asking about the state and memory of his students and asking some of his students "It seems like you are not in a good mood today, why?" it has been observed in the examinations that there are very few prospective teachers who show personal interest. This situation was brought to the agenda at the evaluation meeting of PT1 as follows.

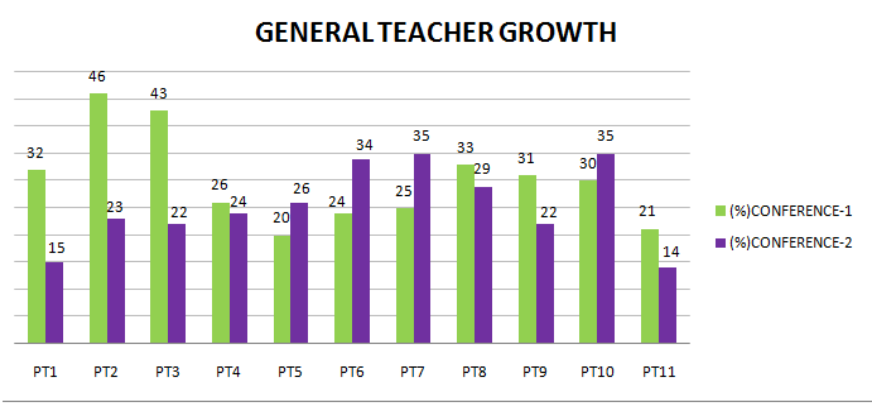
> University supervisor: Being cheerful and asking children "How are you?" was a good way to make engaging the student to the lesson. .

This situation was discussed in the meetings and it was determined that the focus of the prospective teachers was on training the lesson plans and making the lectures better. In the conference meeting of PT7, a comment on the positive effects of personal dialogues with students was mentioned.

> PT7: I noticed that you used frequently "You did very well, thank you." That is very nice of you and pupils like these kind of courtesy. You make them being part of the lesson.

Although the category of Teacher-Student Relationship emerged in some of the prospective teachers' conferences, it could not be observed in others. Personal relationships will help to handle classroom management issues properly and usually students like kind teachers and because of this property they could be interested in the lesson. Yet, prospective teachers have not been able to do this very often. This situation may have overcome by trying to improve the lesson plans of prospective teachers and ignoring their relationships with their students.

General Teacher Growth: The issues such as determining the roles of the teacher in the conference conversations, the professional development comments of the prospective teacher, realizing when to use which strategy, revealing his/her development, his/her feelings about being a teacher, and determining the aspects he/she needs to develop are coded as general teacher growth. When these concepts are compared with other contents in general, it is seen that the first conference has the highest concentration of conversations with a rate of 30%, and the second meeting has a rate of 25%. This reveals that teacher development is mentioned frequently in the conferences. Graph 14, in which the differences between the conferences of each prospective teacher are examined in detail, is given below.



Graph 14. Teacher Development Category.

When Graph14 is examined, it is seen that the content of the first conference of 7 prospective teachers is higher than the second conference on teacher development, while 4 prospective teachers mostly talk about teacher development in the second conference. However, it is also seen that there is a ratio in such a way that there is not too much difference between the two conferences of these 4 prospective teachers. For example, 26% of the codes were

determined as teacher development in the first of the two conference meetings of PT4 and 24% of the codes were determined as teacher development in the second meeting.

In the conference of PT8, the interpretation of the university supervisor who mentioned what the prospective teacher should do to have a teacher role can be seen.

> University supervisor: You are asked about the classroom security incident. So, the issue of fairness and security is very important. In class, children can hurt each other. You need to detect and intercept dangerous activity immediately.

Similarly, in the conference meeting of PT6, the CT commented on how the prospective teacher showed improvement compared to the previous lecture as follows:

> Cooperative Teacher: I think it is impossible to miss the progress compared to the previous one. You were more serious in the class the last time. You were a bit gentler this time. Your feedback was better.

In another conference meeting, how the development of PT1 compared to the previous lecture was evaluated by the university supervisor from the meeting participants is given below:

> University supervisor: In fact, you are making very good progress. That's what I noticed. I wasn't satisfied with your last lesson. Because it was like you weren't taking it seriously. But here, I saw that you took it very seriously, that your preliminary preparation was sufficient, as the teacher said, that you cared about the lesson, and that you were more teaching-oriented in your communication with the students.

In this category, it is determined that prospective teachers often have conversations about teacher development at the conferences. On the one hand, this is an expected result. Because the general purpose of the teaching practicum course is the development of prospective teachers. It is expected that the prospective teachers will be able to make self-evaluation and be aware of their development, or that this development will be stated by the cooperative teachers based on their observations, similarly, the development will be supported by their peers, and finally, it will be appreciated by the university supervisor. For all these reasons, intensive discussion of teacher development content is an expected result.

Discussion, Conclusion & Suggestions

In this study, in which the conversations in 4-person conferences attended by mathematics teachers, relevant academicians and a peer were evaluated after the prospective teachers' lectures, and the conversations were evaluated in terms of their content and types.

It was determined that the more inquiries were made in the second set of meetings than in the first, which reveals the general structure of the comments made to the prospective teachers in the meetings. The inquiries consist of open-ended questions of the university supervisor and are questions aimed at the prospective teacher to make comments about the learning processes of his/her students. The questions of the other participants of the meeting are mostly yes/no questions. The cooperating teachers mostly used evaluative supervision approach. Their evaluations

generally affirmative and they confirm prospective teachers were doing well. Similarly, Borko and Mayfield (1995) found that cooperating teachers did not challenge prospective teachers to think critically about the mathematics after the teaching. Considering the task of training teachers for cooperating, it was concluded that it could not make an effective contribution to the training of prospective teachers. Cooperative teachers are understood not only as practitioners but also as teacher educators who need specific supervision training even though cooperating teachers and college supervisors play different roles with the prospective teacher, by working together, they can influence the improvement of mathematics prospective teachers. Fernandez and Erbilgin (2009) ascertained that the prospective teachers may benefit more if the cooperating teachers' messages were more in harmony with those of the college supervisor. As a result, the STs expected very little useful feedback based on questioning out of the conferences with their mentors, and cooperative teachers. Thobega and Miller (2007) found that cooperating teachers were perceived to use the nondirective style of developmental supervision, whereas most university supervisors seemed to favor the collaborative style.

Based on the assessing type of feedback, it was observed that prospective teachers made more negative evaluations in their first meeting conversations compared to the second. Positive comments emerged in the context of the changes they made about the criticisms they received at the first meeting. Conferences' evaluations show a cluster in pedagogical knowledge and classroom management. Classroom management appears to be the most challenging topic for prospective teachers within the scope of the teaching practicum course. In the conferences examined in this research, classroom management emerged quite a lot both as the subject of the evaluation and in the examination of the contents of the conversations. Peterson et al. (2005) tried to find out the factors that inhibited secondary mathematics prospective teachers and CTs from discussing mathematics-specific ideas. The researchers stated that CTs and prospective teachers believed that the taught mathematics was open so that the other topics such as classroom management issues were more important than talking about mathematics. Classroom management styles were discussed both in the reflections of the prospective teachers and in the comments of the meeting participants. The cooperative teachers in Leatham and Peterson's (2010) study identified a classroom as a primary goal of prospective teachers teaching and interacting with students or understanding the students' thinking as secondary issues. Although many CTs may agree that learning to manage time and understand students' comments and questions are two main goals of the internship, our data indicate that CTs may have different expectations. In a case study with two prospective teachers and their cooperative teachers, Fernandez and Erbilgin (2009) found that cooperating teachers discussed mostly classroom management issues in their conferences with prospective teachers and they never discussed specific issues to mathematics content.

Describing types of feedback is mostly observed when the PSTs tried to explain themselves to conference participants about their teaching. While prospective teachers made explanations about the course in the first meetings, they mentioned about the learning environment they created in the classroom and explanations for themselves in the second meetings. The reason for this difference may be due to the possibility of increased awareness of prospective teachers about the teaching environment and their teaching actions.

Suggestion type of feedback has occurred in both conferences almost to the same degree because this type of feedback is the main idea of the conferences. According to Bates et al. (2011) supervisors have a powerful effect on the identity, self-perception, and proficiency of future teachers. Therefore, the suggestions made by future teachers are better.

Describing and emotional conversations are the least occurred types of feedback in the conferences. In the conferences, definitions of concepts or making direct observations or the feelings of prospective teachers were rarely mentioned. Although describing the classroom and teaching moment is the most important category that can provide the prospective teacher with a learning environment, there are very few data on the matter. This may be a sign that prospective teachers are less equipped to theoretically examine pedagogical situations. In post-course conferences, CTs prefer to concentrate on the evaluation of the lesson conducted by the prospective teacher and not generally focused on the next lesson (Douglas, 2011; Hoffman et al., 2015). Because of this, post-course conferences became less effective for PTs' learning when reflection on the teaching is not proposed (Gibbons & Cobb, 2017). Therefore, making self-reflection is important for PTs' professional development. Moreover, feedback from CTs and peers on PTs' teaching also necessary to improve teaching skills (Lee & Wu, 2006). The provided feedback give opportunities to PTs' understand their skills during the learning process and how they can develop these skills in future practice (Thurlings et al., 2013).

In the emotions category, the fact that there are more data, especially in the first meeting, is that prospective teachers focus on the emotional dimension of their profession and the emotional consequences of their first lectures in the real classroom before their development and mathematics course components. Aligned with the findings of Lopez-Real et al. (2001), topics that are discussed between supervisors and student teachers revealed that these topics are mostly concerned with "personal aspects" such as presence, enthusiasm, commitment, and general attitude. In the conferences, prospective teachers are found not to establish an emotional connection with their students and the classroom in general due to their focus on carrying out the lesson plans and the process, and very few conversations were made on these issues. These conversations were also brought together with the name of teacher-student relations and very few conversations occurred in this category. In addition, CTs believed that PTs already had the mathematical knowledge they needed to teach, and this was reinforced by the fact that PTs were sometimes reluctant to reveal gaps in their mathematical knowledge to their CTs.

According to the content of the conferences the general pedagogy appeared mostly in the first conference yet the mathematics, pedagogy more frequently appeared in the second one. Recent research has also suggested that CTs may rarely discuss issues specific to mathematics during their conferences with PTs. Fernandez and Erbilgin (2009) followed the post-course conferences that two PTs held with their CTs. CTs and PTs discussed mostly classroom management issues, and the two CTs were never discussed mathematical content in their conferences with PTs. This situation also shows how the focus of prospective teachers changes. In their first lectures, prospective mathematics teachers who are generally interested in being teachers focused more on how to teach mathematics in their second lectures. Although mathematics teaching knowledge is mentioned frequently, a very limited number of conversations were held in the context of mathematics knowledge. Some cooperating teachers did not discuss mathematics with the

PTs because they believed the mathematics was straightforward and the PTs had already mastered the content, they found classroom management issues new for them, or the PTs and CTs did not feel comfortable discussing more personal matters with each other. In the general mentoring procedure, CTs mostly give emotional support (Kemmis et al., 2014), and they often discuss general pedagogical issues rather than content-based teaching practice (Valencia et al., 2009). Few mentoring procedures focus more on instructional issues, such as how to improve lesson planning and teaching quality (Giebelhaus & Bowman, 2002; Gold, 1996).

Most PTs prefer the cooperative supervision style in which they believe that PTs should be given considerable autonomy in the teaching experience. The main idea underlying this belief is that PTs are professionals who have to learn making difficult discussions and taking responsibility on their teaching. When problems are encountered, the CT encourages the PT to explore possible solutions and come up with their own decisions. This supervision type is nondirective and needs independence and problem solving on the part of PTs.

Finally, the category of teacher development is mentioned frequently, in which the comments of prospective teachers on their development are gathered. It is not surprising that there are many conversations in this category since the main purpose of the conferences is the process of enhancing prospective teachers' awareness of their teaching actions and theoretical knowledge of the teaching process. The more non-directive and collaborative were the relationships between CTs and PTs, the more positive were the attitudes of PTs toward teaching as a profession and themselves as teachers (Ibrahim, 2013).

Recommendations

The results of this study are limited to the analysis of the data from the prospective teachers at the conferences after only two lectures. For prospective teachers to increase their self-inquiries, eliminate their deficiencies in classroom management, develop their skills in the teaching profession, examine the student emotions in the classroom more, and prepare themselves better for this process in the future, the number of these meetings that the prospective teachers can evaluate themselves can be increased.

Although a positive criticism of the prospective teachers during the meeting increases their self-confidence, a negative criticism may cause the prospective teachers to feel inadequate. Therefore, the fact that the content of the meeting consists of suggestions that will contribute to the development of the prospective teachers rather than criticism and that contain clues about how they should overcome their deficiencies regarding their teaching processes may enable the prospective teachers to be more competent in the future.

Before the lecture, the lesson plan evaluation can be made with the university supervisor to eliminate the general pedagogy and mathematics pedagogy knowledge problems of the prospective teachers and to eliminate the time management problems that are quite common in the lectures. The university supervisor may ask the prospective teachers for a pre-course expectation report and a post-course feedback report on their expectations. It can be ensured that prospective teachers have a lecture experience during their undergraduate education.

In the conferences, as a result of the inquiries made about the teaching processes during the lesson, the prospective teachers made explanations about these processes, and as a result of the inquiries made about how the lessons could be improved, they made suggestions to themselves about how they could realize and correct the mistakes they made during the lesson. Lyle (1996) states that supervision provides scaffolding in student teachers' zone of proximal development.

Instead of making inquiries that require an explanation for the prospective teachers to contribute to their development, the number of inquiries that will enable them to make self-reflections can be increased.

The fact that the prospective teachers are observed by many people during the lesson may stress them and cause them to get anxious. This may negatively affect the performance of the prospective teachers. To prevent this, the lectures of the prospective teachers can be recorded with a camera, etc. and comments can be made by watching the video with the meeting participants after the course.

Ethic

This research was conducted in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and ethical standards.

Author Contributions

This article was written with the joint contributions of three authors.

Conflict of Interest

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General Understanding Regarding to the Fraction and Rational Number Concepts*

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Abstract

The aim of the current research is to examine the studies carried out to determine the understanding of the concepts of fraction and rational number of students, teachers and prospective teachers and to reveal the general understanding by synthesizing the findings of these studies. For this purpose, meta-synthesis research method, in which qualitative studies are again interpreted and synthesized with a qualitative understanding, was used in the study. Within the scope of the study, a total of 14 studies conducted in Turkey within the framework of the qualitative research paradigm were examined in order to reveal the understanding regarding to the concepts of fraction and rational number. Content analysis was used in the analysis of the obtained data. As a result of the research; It has been determined that students, teachers and prospective teachers have various understandings regarding to the concepts of fraction and rational number. One of the remarkable results is that the prospective teachers have an understanding that the numerator and denominator of the fraction are real numbers, while the teachers have an understanding that the numerator and denominator can be integer, natural number or positive integer. Also, it was found that students associate the rational number with negativity while associating the fraction with positivity.

Key Words

Fraction • Rational number • Understanding • Comprehension • Meta-synthesis

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Concepts

The concept of fraction is the basis of such important topics as rational number, ratio and proportion in mathematics, but it is also directly or indirectly related to many concepts and topics included in the curriculum. For this reason, the teaching of the concept of fraction, which has an important place in all stages of the education process, starts with the first grade (MEB, 2018). After the students become able to perform abstract operations with the concept of fraction, the concept of rational number, which covers fractions, is taught in the 7th grade. From the different definitions encountered in the literature on the concepts of fraction and rational number in the later years of school mathematics, definitions made in accordance with the fact that the rational number includes fractions are included in the content of mathematics courses in parallel with the curriculum. In this sense, fraction knowledge is seen important for the development of the rational number concept (Carraher, 1993).

Fraction has five different meanings as part-whole, quotient (division), operator, ratio and measure (Lamon, 1999). The part-whole meaning includes a meaning beyond scanning a region, showing the relationship between the parts of continuous or discontinuous objects and themselves. Considered from this framework, the fraction represents a certain part of a set divided into equal sized pieces (Jones, 2012). The quotient (division) meaning of fraction is the quotient obtained by dividing one number by another number (a: numerator; b: denominator; $\frac{a}{b}$: quotient). This meaning is mostly seen in situations where some multiplicity is shared to certain people in daily life. The operator meaning of fraction emerges in cases of a certain amount is enlarged or reduced (Lamon, 1999). Fraction in the sense of ratio expresses the relationship between the quantities to be compared (Cramer & Post, 1995). According to the meaning of measure, fraction; represents measurement quantities such as length, area, and volume. While the fraction measures the distance of the point on the number line from zero in one-dimensional space, it measures the area in a two-dimensional space (Lamon, 1999). As previously stated, different opinions have been put forward by mathematics educators about the the definitions of fraction and rational number concepts, which are given as a continuation of each other in our curriculum. For example, Musser et al., (2014) states that the values of a and b that make up the fraction $\frac{a}{b}$ can take non-negative integer ($b\neq0$) values. Niven (1961), on the other hand, uses the concepts of rational number and rational fraction as synonymously; he defines a rational number (or a rational fraction) as a number that can be expressed in the form $\frac{a}{b}$, where a and b are integers and b are different from zero. According to him, when the concept of fraction is used alone, it expresses an algebraic representation consisting of numerator and denominator; as in the examples $\frac{\sqrt{5}}{3}$, $\frac{x}{2}$, $\frac{x^2+1}{x-1}$. According to Bennett et al. (2016), the numerator and denominator of a fraction can be any number as long as the denominator is not zero. For example; $\frac{3}{8}$, $\frac{7}{16}$, $\frac{1,2}{7}$, $\frac{1}{\sqrt{3}}$ ... as such. Based on this expression, the mathematical definition of the fraction concept can be made as $K = \{\frac{a}{b}: a,b\in R \text{ and } b\neq0\}$. If the numerator and denominator of a fraction take integer values, this fraction is called a rational number. For example; $\frac{1}{9}$, $\frac{-3}{7}$, $\frac{10}{3}$ … Thus, the mathematical definition of the rational number concept can be expressed as follows:

$$R = \{\frac{a}{b}: a,b\in Z \text{ and } b\neq0\}.$$

Kieren (1976) expresses rational numbers as the representative of the equivalence class formed by fractions. Rational numbers are the equivalence class of $\frac{a}{b}$ fractions, with b≠0 under the ≈ relation. If the following equality exists between the (a,b) and (c,d) ordered pairs, the (a,b) fraction is said to be equivalent to the (c,d) fraction.

$$\frac{a}{b} \approx \frac{c}{d} \leftrightarrow a.d=b.c$$

Depending on the differences encountered in the definitions of fraction and rational number concepts, there are also many different opinions in the literature about the relationship of these concepts to each other. Some of these opinions include:

- Fractions do not have to be rational number (Niven, 1961).
- Rational numbers are fractions on which arithmetic operations can be performed (Kieren, 1976).
- The simplest form of fractions is rational numbers (Çelik, 2006).
- Fractions are a subset of rational numbers. That is, every fraction is a rational number, but not every rational number may express a fraction (Lamon, 2007).
- Fraction and a rational number are separate concepts from each other. Although a fraction is not a rational number, a rational number is also not a fraction (Argün et al., 2014).

Rationale and Purpose of the Study

There are many different definitions of the concepts of fraction and rational number in the current literature. Due to the diversity in the literature, it is thought that it is difficult for students, teachers and adults to make sense of these concepts. Many studies have been carried out in Turkey in order to determine the meanings that students, teachers and prospective teachers attribute to the concepts and how they define the concepts. However, since each study is conducted with a limited number of participants and a specific audience, there is no study in which studies are evaluated together and comprehensive inferences are made. There is a need for a large-scale research on how students, teachers and prospective teachers define concepts. For this reason, in the present study, it is aimed to examine the studies carried out to determine the understanding about the concepts of fraction and rational number of students, teachers and prospective teachers and to reveal the general understanding by synthesizing the findings of these studies. Therefore, within the scope of the research, the answer to the question "How are the detected understandings about these concepts as a result of the studies carried out in Turkey before May 2021 on Fractions and Rational Numbers?" is being sought. The sub-problems of the research question are as follows:

a) What are the understandings of students, teachers and prospective teachers about the concept of fraction?
b) What are the understandings of students, teachers and prospective teachers about the concept of rational number?
c) What are the understandings of students, teachers and prospective teachers towards the relationship between fraction and rational number concepts?

Method

Research Design

In the present study, the Meta-Synthesis (Thematic Content Analysis) research method was used due to the fact that a systematic review of the findings obtained from qualitative research carried out to reveal the understanding of students, teachers and prospective teachers about fraction and rational numbers in Turkey before May 2021 has been carried out. The meta-synthesis method includes the synthesis and interpretation of qualitative studies carried out a specific topic, again, within the framework of a qualitative understanding (Gümüş, 2018). With this method, beyond the individual findings of the studies, new meanings and explanations are revealed as a result of comparing the key concepts obtained from each study with each other (Thomas and Harden, 2008).

Research Sample/Study Group/Participants

Within the scope of the research, qualitative studies/documents conducted to determine the understanding, image and schemas of individuals related to the concepts of fraction and rational number were used. The studies included and excluded from the research are explained in detail below:

Inclusion Criteria

The theses and articles considered in the present research should meet the following criteria;

- ✓ Must have been published before May 2021,
- ✓ The sample subject to the study should be within the borders of Turkey,
- ✓ Should have been made to determine the understanding of individuals regarding the concepts of fraction and rational number,
- ✓ Should use one of the qualitative research designs or, if quantitative, use qualitative data collection methods,
- ✓ Must have been published in a peer-reviewed journal (for articles only), and
- ✓ The full text of the study should be reached.

Exclusion Criteria

Contrary to the items mentioned above; Studies published after May 2021, studied on a foreign sample, conducted with a quantitative understanding and using quantitative data collection methods, containing incomplete text, not published in a peer-reviewed journal, and not aimed at determining the conceptual understanding of individuals for the concepts of fraction and rational number were excluded from the scope.

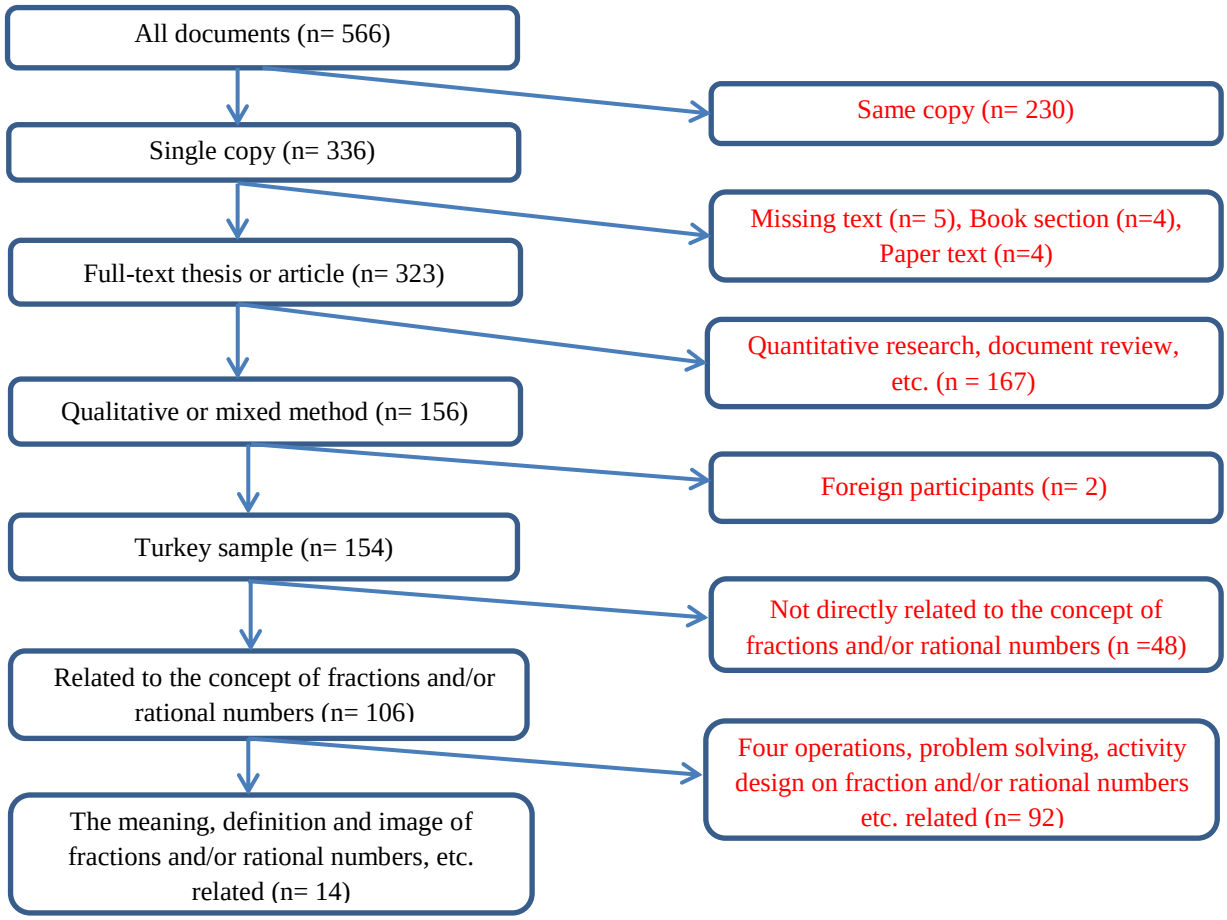
Research Instruments and Processes

In order to collect data, studies on Fractions and Rational Numbers were reached by using Yök Thesis, Yök Academic (article), Google Scholar, ULAKBIM and Web of Science databases. At this stage, ‘kesir’, ‘kesir kavrayışı’, ‘rasyonel sayı’, ‘rasyonel sayı kavrayışı’, ‘fraction’, ‘fraction conception’, ‘fraction understanding’, ‘rational number’, ‘rational number conception’ and ‘rational number understanding’ keywords were scanned in

databases and 566 studies were reached. The shema regarding the inclusion process of the documents that are the subject of the study is given in Figure 1.

Figure 1

Flow Chart of the Inclusion Process of Studies



Firstly in the process of elimination in accordance with the criteria the obtained documents, 230 studies were excluded from the scope, which were determined to be the same copy among 566 documents. Since the research will be carried out with articles and dissertations, documents such as missing text (5), book section (4) and paper text (4) were excluded from the remaining 336 studies. The qualitative findings of the studies were evaluated because it was wanted to reveal the understanding of individuals about fraction and rational number. For this reason, studies carried out with only quantitative research method or studies such as document review are excluded from the scope. As a result, out of 323 studies, 156 studies carried out by qualitative and mixed research methods were determined in accordance with the criteria. Among these studies, 2 studies that were not carried out on a sample from Turkey were excluded from the scope. In addition, the titles and abstracts of the remaining 154 studies were examined in general and studies (48) that were found not to be directly related to the concepts of fraction and/or rational number were excluded from the scope. The abstracts, research problems and methods of 106 studies, which were determined to be directly related to the concepts of fraction and/or rational number, were examined in detail and those related to

individuals' understanding, image or definition of fractions and/or rational numbers were determined (14). The identified 14 studies were subjected to 'quality assessment'. The quality assessment put forward by Pluye et al. (2009) evaluates the methodological quality of qualitative, quantitative and mixed-method primary studies. As a result of the evaluation, it was determined that all studies received 75 points and above. This evaluation can be interpreted that the studies are of high quality in terms of qualitative research.

Data Analysis

The data obtained from the documents were analyzed with the content analysis method. Content analysis is a technique in which inferences are made for the objective and systematic recognition of certain characteristics of a message (Büyüköztürk et al., 2017). The main purpose of using this analysis method is to reach the concepts and relationships that can explain the obtained data (Yıldırım and Şimşek, 2018).

After the data analysis was performed, part of the documents was examined by a second expert independent of the study in order to ensure the reliability of the encoder. As a result of expert evaluation, the Miles Huberman coefficient was found to be 84%.

$$\frac{Number\ of\ Subject/Terms\ with\ Consensus}{Total\ Number\ of\ Views} * 100$$

In order to ensure internal consistency, it is necessary to have at least 80% consensus among encoders (Patton, 2014). Therefore, the coefficient obtained in the context of our research provides the specified criterion.

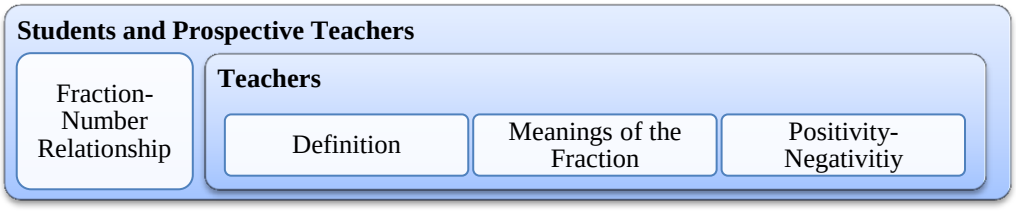
Results

Findings about Fractions

As a result of data analysis, 4 basic categories related to fractions have emerged (see Figure 2). In the studies conducted with students and prospective teachers, opinions belonging to the categories of *Definition*, *Meanings of the Fraction*, *Fraction-Number Relationship* and *Positivity-Negativity* are included, while in the studies conducted with teachers, opinions belonging to the categories of *Definition*, *Meanings of the Fraction* and *Positivity-Negativity* are included.

Figure 2

The Main Categories That Arise in Relation to Fractions



The resulting sub-categories related to fractions are presented in Table 1.

Table 1

Sub-Categories Related to the Concept of Fraction

Categories	Sub-categories					
	Student		Prospective Teacher		Teacher	
Definition	Fractional notation	$\left\{\frac{a}{b}: \text{a and b relatively prime}\right\}$	Fractional notation	$\left\{\frac{a}{b}: \text{a, b } \in \text{R}\right\}$	Fractional notation	$\left\{\frac{a}{b}: \text{a, b } \in \text{Z and b} \neq 0\right\}$
				$\left\{\frac{a}{b}: \text{a, b } \in Z^{+} \text{ and b} \neq 0\right\}$		$\left\{\frac{a}{b}: \text{a, b } \in Z^{+} \text{ and b} \neq 0\right\}$
				$\left\{\frac{a}{b}: \text{a, b } \in \text{N and b} \neq 0\right\}$		$\left\{\frac{a}{b}: \text{a, b } \in \text{N and b} \neq 0\right\}$
						$\left\{\frac{a}{b}: \text{a, b } \in \text{N}\right\}$
	Simple verbal expression		Simple verbal expression		Simple verbal expression	
	Exact divisible number		Exact divisible number		Ordered pair	
	Expression over fraction types		Exact non-divisible number			
Meanings of the Fraction	Quotient (Division)		Quotient (Division)		Quotient (Division)	
	Operator		Operator		Operator	
	Ratio		Ratio		Ratio	
					Ratio and fraction are different things	
	Measure		Measure		Measure	
	Part-Whole	Equal parts	Part-Whole	Equal parts	Part-Whole	Equal parts
		No equal parts requirement		No equal parts requirement		No equal parts requirement
Fraction-Number Relationship	Cyclic expressions are not fractions		Each number is a fraction			
			Irrational numbers are not fractions			
	Irrational numbers are not fractions		Fractions do not cover integers			
			Fractions cover integers			
	Decimal number		Positive integers are fractions			
			Decimal number			
Positivity-Negativitiy	Positive		Positive		Positive	
			Positive or negative		Positive or negative	

The first category that emerges in relation to fractions is the category "*Definition*". Within the scope of this category, it is revealed how students, prospective teachers and teachers define the fraction. Accordingly, students define the fraction as *fractional notation*, *simple verbal expression*, *exact divisible number* and *expression over fraction types*. The definition that emerges in the fractional notation sub-category is $\{\frac{a}{b}$: a and b relatively prime$\}$. In other words, students who expressed fraction as fractional notation stated that a and b should be prime between them. The definition that emerges in the category of simple verbal expression is 'the structure consisting of numerator, denominator and fraction line'. Students in the category of numbers that are exactly divisible, on the other hand, define a fraction as an expression that is exactly divisible. In addition to these, students whose definition is in the category of 'expression over fraction types' define fractions as 'simple, compound and integer fractions'.

According to the categories obtained from the research findings carried out on the prospective teachers, it is seen that the prospective teachers define the fraction as *fractional notation*, *simple verbal expression*, *exact divisible number* and *exact non-divisible number*. It has been determined that there are 3 different definitions in the fractional notation sub-category. These are;

$$\{\frac{a}{b}: a,b \in R\},$$

$$\{\frac{a}{b}: a,b \in Z^{+} \text{ and } b\neq 0\} \text{ and}$$

$$\{\frac{a}{b}: a,b \in N \text{ and } b\neq 0\}.$$

Accordingly, it is seen that the prospective teachers also have the idea that numbers a and b can take real number values other than integer and natural numbers in fraction representation. In addition to fractional notation, there are also prospective teachers who define fraction as numerator, denominator and fraction line (simple verbal expression), exact divisible numbers and exact non-divisible numbers (i.e. the result of divisions is not equal to an integer).

Teachers define the fraction as *fractional notation*, *simple verbal expression* and *ordered pair*. When the studies with teachers were examined, 4 different definitions emerged in the fractional notation sub-category. These are;

$$\{\frac{a}{b}: a,b \in Z \text{ and } b\neq 0\},$$

$$\{\frac{a}{b}: a,b \in Z^{+} \text{ and } b\neq 0\},$$

$$\{\frac{a}{b}: a,b \in N \text{ and } b\neq 0\}, \text{ and}$$

$$\{\frac{a}{b}: a,b \in N\}.$$

In addition to fractional notation, there are also teachers who define fractions as numerator, denominator and fraction line (simple verbal expression) and ordered pairs (a,b).

Another category that has emerged regarding fractions is the category of "*Meanings of the Fractions*". Within the scope of this category, the meanings attributed to the concept of fraction by students, prospective teachers and teachers are revealed. When the categories are examined, it is seen that the meanings attributed to fractions by

students and prospective teachers are similar. Students and prospective teachers attribute quotient (division), operator, ratio, measure and part-whole meanings to fractions. When the part-whole meaning is examined in detail, it is seen that there are those who think that the whole should consist of equal parts and there are those who think that there is no obligation to divide them into equal parts. It can be said that the findings obtained from student and prospective teachers are similar for teachers. However, in the studies conducted on teachers, it has been determined that there is also the opinion that ratio and fraction are different concepts from each other.

One of the emerging categories related to fractions is the category "*Fraction-Number Relationship*". Within the scope of this category, opinions are expressed about the relationship of fraction with numbers such as integers and natural numbers. There are no opinions of teachers about this category. That is why the opinions of prospective students and teachers are explained. It was determined that the students expressed three different views that cyclic expressions are not fractions, irrational numbers are not fractions, and decimal numbers are fractions. On the other hand, it has been determined that the prospective teachers have different opinions that each number represents a fraction, irrational numbers are not fractions, fractions do not cover integers, fractions cover integers, positive integers are fractions, and decimal numbers express fractions.

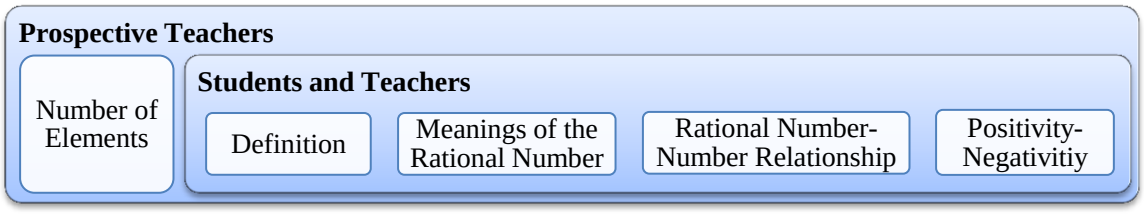
The last category that emerged about fractions is the category of "*Positivity-Negativity*". Within the scope of this category, opinions about the fraction sign are presented. While the students thought that the fraction could only be positive, two different opinions were found among the prospective teachers and teachers. One group has the opinion that the fraction can only be positive, while the other group has the opinion that the fraction can be both positive and negative.

Findings about Rational Numbers

As a result of the research, 5 basic categories related to rational numbers emerged (see Figure 3). In the studies conducted with prospective teachers, opinions belonging to *Definition*, *Meanings of the Rational Number*, *Rational Number-Number Relationship*, *Positivity-Negativity* and *Number of Elements* categories are included, while opinions belonging to *Definition*, *Meanings of the Rational Number*, *Rational Number-Number Relationship* and *Positivity-Negativity* categories are included in the studies conducted with students and teachers.

Figure 3

The Main Categories that Arise in Relation to Rational Number



The resulting sub-categories related to rational number are presented in Table 2.

Table 2

Sub-Categories Related to the Concept of Rational Number

Categories	**Sub-categories**					
	Student		**Prospective Teacher**		**Teacher**	
Definition	Fractional notation	$\left\{\frac{a}{b}: a, b \in Z\right\}$	Fractional notation	$\left\{\frac{a}{b}: a, b \in Z, a \text{ and } b \text{ relatively prime}\right\}$	Fractional notation	$\left\{\frac{a}{b}: a, b \in Z, a \text{ and } b \text{ relatively prime}\right\}$
				$\left\{\frac{a}{b}: a, b \in Z^{+} \text{ and } b \neq 0\right\}$		$\left\{\frac{a}{b}: a, b \in Z \text{ and } b \neq 0\right\}$
				$\left\{\frac{a}{b}: a, b \in Z \text{ and } b \neq 0\right\}$		$\left\{\frac{a}{b}: a, b \in Z\right\}$
				$\left\{\frac{a}{b}: a, b \in Z\right\}$		
	Simple verbal expression		Simple verbal expression		Simple verbal expression	
	Non-irrational real numbers		Non-irrational real numbers			
	Numbers that can go out of the root		Representative of the equivalence class		Representative of the equivalence class	
	Numbers with a limited or cyclic decimal					
Meanings of the Rational Number	Part-Whole	Equal parts	Part-Whole	No equal parts requirement		
		No equal parts requirement				
			Quotient (Division)			
			Ratio		Ratio	
Rational Number-Number Relationship	Natural Number	Natural numbers are rational numbers	Natural Number	Natural numbers are rational numbers		
		Natural numbers are not rational numbers				
	Zero	Zero is the rational number	Zero	Zero is the rational number	Zero	Zero is the rational number
		Zero is not the rational number				
	Integer	Rational numbers cover integers	Integer	Rational numbers cover integers	Integer	Rational numbers cover integers
		Rational numbers do not cover integers		Rational numbers do not cover integers		
		Integers are not rational numbers				
	Comma	Numbers with commas are	Comma	Numbers with commas are rational		

	expression	rational numbers	expression	numbers	
		Cyclic or decimal expressions are not rational numbers		Cyclic or decimal expressions are not rational numbers	
	Other	Every number is a rational number			
		There are rational numbers that are not real numbers			
		Every irrational number is a rational number			
Positivity-Negativity			Positive		
	Negative		Negative		
	Positive or negative		Positive or negative		Positive or negative
Number of Elements			Rational numbers are infinite		
			Rational numbers are countably infinite		
			Rational numbers are uncountably infinite		
			Rational numbers are finite		

The first category that emerges in relation to rational numbers is the category "*Definition*". Within the scope of this category, it is revealed how students, prospective teachers and teachers define the rational number. When the studies are examined, it is seen that students define a rational number as *fractional notation*, *simple verbal expression*, *non-irrational real numbers*, *numbers that can go out of the root*, and *numbers with a limited or cyclic decimal*. The definition that emerges in the fractional notation sub-category is $\{\frac{a}{b}: a,b \in Z\}$. In other words, students who express rational numbers as fractional notation have the understanding that a and b must be integers. The definition that emerges in the category of simple verbal expression is 'the structure consisting of numerator, denominator and fraction line'. In addition, it has been determined that some students try to define rational numbers through irrational, rooted or decimal notation. These definitions are as follows; 'Non-irrational real numbers are called rational numbers', 'Numbers that can go out of the root are called rational numbers' and 'Numbers with a limited or cyclic decimal'.

In the studies examined, it is seen that prospective teachers define rational numbers as *fractional notation*, *simple verbal expression*, *non-irrational real numbers* and *representative of the equivalence class*. It has been determined that there are 3 different definitions in the fractional notation sub-category. In the subcategory of fractional notation, 4 different definitions appear. These are;

$$\{\frac{a}{b}: a,b \in Z, \text{ a and b relatively prime}\},$$

$$\{\frac{a}{b}: a,b \in Z^{+} \text{ and } b\neq 0\},$$

$$\{\frac{a}{b}: a,b \in Z \text{ and } b\neq 0\}, \text{ and}$$

$$\{\frac{a}{b}: a,b \in Z\}.$$

In addition to these, there are also prospective teacher who stated that the rational number consists of numerator, denominator and fraction line (simple verbal expression), non-irrational numbers are called rational numbers, and the expression representing equivalent fractions (representative of the equivalence class) is a rational number.

Teachers, on the other hand, define rational numbers as *fractional notation*, *simple verbal expression* and *representative of the equivalence class*. In studies conducted with teachers, it has been determined that there are 3 different definitions in the fractional notation category. These are;

$$\{\frac{a}{b}: a,b \in Z, \text{ a and b relatively prime}\},$$

$$\{\frac{a}{b}: a,b \in Z \text{ and } b\neq 0\}, \text{ and}$$

$$\{\frac{a}{b}: a,b \in Z\}.$$

Besides these definitions, there are also teachers who state that the rational number consists of numerator, denominator and fraction line (simple verbal expression) and that it is an expression representing equivalent fractions (representative of the equivalence class).

Another category that has emerged regarding rational numbers is the category of "*Meanings of the Rational Numbers*". Within the scope of this category, the meanings attributed to the concept of rational number by students, prospective teachers and teachers are revealed. In the studies conducted with the students, it was seen that the *part-whole* meaning of rational numbers was revealed. Among the students, there are those who express that the whole should consist of equal parts, as well as those who express that the whole does not have to be divided equally. The meanings that the prospective teachers attribute to the rational number are the meanings of *part-whole, quotient (division)* and *ratio*. The prospective teachers who said that the rational number expresses the part-whole meaning did not state that the whole must be divided into equal parts. In the studies conducted with teachers, it has been seen that only the meaning of *ratio* is loaded into rational numbers.

Another category that has emerged regarding rational numbers is the category of "*Rational Number-Number Relationship*". In the studies conducted with the students, it was seen that the relationship with *natural numbers*, *zero*, *integer*, *comma expression* and *other numbers* of rational numbers was established. Students have both opposite views on whether natural numbers and zero are rational numbers or not. It has been observed that some of the students stated that these expressions were rational numbers, while others stated that they were not rational numbers. There are three different views on integers. These are the views that 'rational numbers cover integers', 'rational numbers do not cover integers' and 'integers are not rational numbers'. There are also two opinions about the relationship of comma expressions with rational numbers in the form of 'Numbers with commas are rational numbers' and 'cyclic or decimal expressions are not rational numbers'. Finally, the opinions contained in the other category are those that 'every number indicates a rational number', 'there are rational numbers that are not real numbers' and 'every irrational number is a rational number'.

In the studies conducted with the prospective teachers, it was seen that the relationship with *natural numbers*, *zero*, *integer* and *comma expression* of rational numbers was established. Prospective teachers are of the opinion that 'natural numbers and zero are rational numbers'. There are two opposite opinions in prospective teacher regarding the integer-rational number relationship as 'rational numbers cover integers' and 'rational numbers don't cover integers'. In addition, there are opinions about the comma expression as 'numbers with commas are rational numbers' and 'cyclic or decimal expressions are not rational numbers'. In the studies conducted with teachers, it was seen that the relationship with *zero* and *integer* of rational numbers was established. Teachers have expressed the opinion that 'zero is a rational number'. As for the integers, it has been understood that there is a common opinion that 'rational numbers cover integers'.

The fourth category that emerged in relation to rational numbers is the "*Positivity-Negativity*" category. Within the scope of this category, the opinions of students, prospective teachers and teachers regarding the sign of the rational number are presented. There are two different opinions among students as 'rational numbers are negative' and 'rational numbers can be positive or negative'. It is revealed that there are three different opinions among prospective teachers. These are 'rational numbers are positive', 'rational numbers are negative' and 'rational numbers can be positive or negative'. In the studies conducted with teachers, it was seen that teachers expressed a

common idea about the sign of rational numbers. Teachers express that 'rational numbers can be positive or negative'.

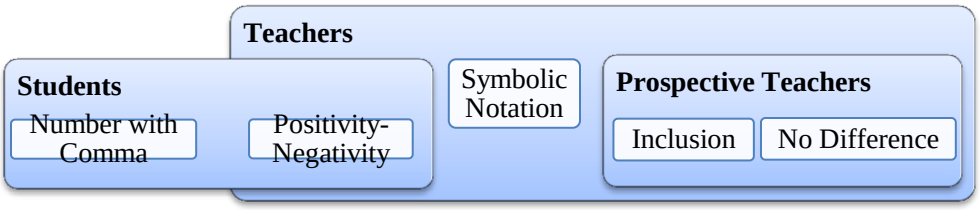
The last category that emerged about rational numbers is the category of "*Number of Elements*". Within the scope of this category, the number of elements of rational numbers is revealed. In the studies conducted, it was observed that students and teachers did not express an opinion about the number of employees. On the other hand, prospective teachers expressed four different opinions. These are; rational numbers are *infinite*, *countably infinite*, *uncountable infinite*, and *finite*.

Findings about Relationship between Fractions and Rational Numbers

As a result of the research, 5 basic categories have emerged regarding the relation between fractions and rational numbers (see Figure 4). Opinions belonging to the categories *Positivity-Negativity* and *Number with Comma* in the studies conducted with students; *Inclusion* and *No Difference* in the studies conducted with prospective teachers; and *Inclusion*, *No Difference*, *Symbolic Notation* and *Positivity-Negativity* in the studies conducted with teachers are included.

Figure 4

The main Categories that Arise for Regarding the Fraction-Rational Number Relationship



The resulting sub-categories related to fraction-rational number relationship are presented in Table 3.

Table 3

Sub-Categories Related to Fraction-Rational Number Relationship

Categories	Sub-categories		
	Student	**Prospective Teacher**	**Teacher**
Inclusion		Fractions can contain irrational numbers, but rational numbers can not	Fractions cover rational numbers
		Fractions cover rational numbers	
		Fractions cover integers, rational numbers don't	Rational numbers cover fractions
		Rational numbers cover fractions	
		Rational numbers cover integers, fractions don't	
No Difference		Fraction and rational number are two concepts that have the same meaning	Fraction and rational number are two concepts that have the same meaning
Symbolic Notation			Fraction is one of the symbolic notations of rational numbers
Positivity-Negativity	The number written in $\frac{a}{b}$ format is a fraction if it is positive, and a rational number if it is negative		There is only difference in sign between them
	Fraction can not be negative, rational number can be both negative and positive		Fraction can not be negative, rational number can be both negative and positive
Number with Comma	If it is infinite after the comma, it is rational, if it is finite, it is fraction		

The first category that emerges regarding the fraction-rational number relationship is the category "*Inclusion*". In this category, it is stated that fraction and rational number concepts differ in terms of the number sets they cover. While there was no opinion belonging to this category in the studies conducted with the students, the prospective teachers and teachers gave different opinions. When the opinions of prospective teachers are examined, it is seen that five different views have emerged. These are;

- Fractions can contain irrational numbers, but rational numbers can not.
- Fractions cover rational numbers.
- Fractions cover integers, rational numbers don't.
- Rational numbers cover fractions.
- Rational numbers cover integers, fractions don't.

According to the classifications obtained from the studies conducted with teachers, it has been determined that teachers have two opposite understandings. These are 'Fractions cover rational numbers' and 'Rational numbers cover fractions'.

Another category that has emerged regarding the fraction-rational number relationship is the category of "*No Difference*". In this category, it is stated that there is no difference between the concepts of fractions and rational numbers. In the studies conducted with the students, it was seen that the students did not express their opinions in this category. It has been observed that prospective teachers and teachers have the understanding that 'fraction and rational number are two concepts that have the same meaning'.

The third category that emerged regarding the fraction-rational number relationship is the "*Symbolic Notation*" category. It has been observed that students and prospective teachers did not express their opinions regarding this category. In the teachers under this category, there is an idea that 'fraction is one of the symbolic notations of rational numbers'.

The fourth category that emerged regarding the fraction-rational number relationship is the "*Positivity-Negativity*" category. People who are included in the scope of this category have the opinion that fractions and rational numbers differ due to their signs. In the studies conducted with prospective teachers, there is no opinion expressing that fraction and rational numbers differ due to their signs. In the studies conducted with students, it was determined that there were two opinions about the difference in sign. These are; 'the number written in $\frac{a}{b}$ format is a fraction if it is positive, and a rational number if it is negative' and 'fraction can not be negative, rational number can be both negative and positive'. Two opinions have also emerged in studies conducted with teachers. These are; 'there is only difference in sign between them' and 'fraction can not be negative, rational number can be both negative and positive'.

The last category that emerged regarding the fraction-rational number relationship is the category of "*Number with Comma*". Prospective teachers and teachers did not express an opinion on this category. On the other hand, the students who expressed their opinions in the category of numbers with commas hold the opinion that "if it is infinite after the comma, it is rational, if it is finite, it is fraction".

Discussion, Conclusion & Suggestions

One of the remarkable results that emerged as a result of the synthesis of studies on the concept of fraction is related to the definitions of teachers and prospective teachers under the fractional notation category. While prospective teachers have the opinion that a and b can take real number values in the expression $\frac{a}{b}$, this opinion is not found in the teachers. Teachers are of the opinion that a and b can take integer, natural number or positive integer values in the expression $\frac{a}{b}$. While it is expected that teachers will master higher-level definitions due to factors such as academic equipment and experience, the opposite situation has arisen. The reason why the high-level definition did not appear in teachers may be related to the age level at which they are actively teaching. While the concept of fraction is defined over positive integers at the younger age level, the range of the definition set is expanded as the age level progresses. Therefore, it can be said that teachers have over time moved away from the high-level definition and adopted the definition of the age level at which they teach. It is thought that the reason why prospective teachers make higher-level definitions is that they encounter definitions at this level during their undergraduate courses.

The effect of defining the concept of fraction, defined over positive integers at young age levels, as high level at higher age levels is also seen in the findings related to the sign of the fraction. In the studies carried out on the fraction sign, the students have said that the fraction can only be positive, while the teachers and prospective teachers said that the fraction can only be positive besides can receive both positive and negative values. While it is an expected result that the students think that the fraction should only be positive, the opinion of the teachers and prospective teachers that the fraction can only have a positive value is compatible with the different definitions. This situation is considered as an indication that teachers and prospective teachers have adopted the definition appropriate for the age level they are teaching/will be doing instead of the high-level definition.

One of the interesting results that has emerged regarding the concept of fractions is that some students and prospective teachers define a fraction as the ratio of two exact divisible numbers. According to this definition, the set of integers and the set of fraction numbers overlap each other. The ratio of two numbers that are not exactly divisible (having a decimal notation) is not defined as a fraction. Accordingly, the expression $\frac{4}{2}$ indicates a fraction, while the expression $\frac{2}{4}$ does not.

In the literature, it is stated that the fraction has five different meanings: quotient (division), operator, ratio, measure, and part-whole (Lamon, 1999). As a result of the research, it was seen that students, teachers and prospective teachers have knowledge about all of these meanings. However, it is understood that there is confusion in the all three groups about the part-whole meaning of the fraction, about whether or not the whole must be divided equally. In the definitions and explanations made about the meaning of fraction, it is seen that there is no emphasis on the necessity of equal fragmentation of the whole, which should be emphasized mainly in the sense of the part-whole of the fraction.

Although the concepts of fraction and rational number are both shown as $\frac{a}{b}$, some academic definitions require that the values of a and b be prime between them for rational numbers (Kieren, 1976). When the categories that emerged as a result of the studies conducted with the students are examined, it is seen that the students stated the condition of being prime among them for fractions, but they did not mention such a condition for rational numbers. This situation can be interpreted as the students cannot make sense of being prime among them and therefore confuse the concepts of fractions and rational numbers.

It is seen that the common definition for the concept of fraction and rational number in students, prospective teachers and teachers is a simple verbal expression, that is, the definition that includes numerator, denominator and fraction line. This situation means that individuals make a definition by using the symbolic notation of the fraction in order to define the concepts. Thus, it can be said that in the definitions made, there is not enough information about the properties of the numbers that should be included in the numerator and denominator of the fraction or rational number, or there is a lack of awareness of the need to include this information in the definitions. Therefore, there are no differences between the concepts of fraction and rational number for individuals who make these definitions.

One of the interesting results that emerged as a result of the research is related to the signs of fraction and rational number concepts. In the studies conducted with the students, the opinion that the fraction can only take a positive value emerged, while the opinions about the rational number concept that it can only take a negative value and be positive or negative emerged. Therefore, while students associate negativity with the concept of rational number, they associate positivity with the concept of fraction. This finding is also supported by the findings regarding the fraction-rational number relationship as a result of the studies conducted with the students. In the studies conducted, some of the students stated that the fraction and the rational number are separated from each other only because of the sign difference. In this direction, two different opinions have emerged. However, the common situation in both opinions is that the fraction is associated with positivity and the rational number with negativity.

It has been revealed that teachers and prospective teachers have the opinion that there is no difference between fractions and rational numbers (that is, these expressions are two concepts with the same meaning). However, it is noticeable that no findings in this direction have been obtained in the studies conducted with the students. While it is possible for students to think of fraction and rational number concepts as the same concept under normal conditions, this situation was observed in teachers and prospective teachers. This situation can be explained by the fact that teachers and prospective teachers cannot synthesize different definitions of fraction and rational number concepts and the relationships between them, and they have a mental confusion about the differences between the two concepts.

Recommendations

In the current study, it is revealed that students, teachers and prospective teachers have various understandings of the concepts of fraction and rational number. The conceptual confusion of teachers and prospective teachers who will be teachers of the future can be shown as the reason for the different understandings that arise in students. Because the fact that the concepts are not correctly sense making in the mind of the person who teaches will naturally affect the content of the teaching they will give. Therefore, in order for students to understand the concepts correctly, it is

important that first of all, prospective teachers know the correct meanings and correct definitions of the concepts. For this reason, it is suggested that the different meanings of the concepts of fractions and rational numbers in the undergraduate education within the scope of the research, the different views in the literature on this subject and how they can be taught to students should be questioned with a critical perspective.

Fraction and rational number concepts are related to concepts such as integer, natural number, irrational number, rooted expression. However, as a result of the study, it is seen that the relationship between these concepts in individuals is not sufficiently established. For this reason, the relationship between these concepts at every learning level should be emphasized and discussed. The elementary school-middle school level fraction and integer relationship can be compared, while the high school level fraction and rational number have a rooted expression, irrational number, etc. comparisons can be made with.

The research carried out reveals the current understanding of fraction and rational number concepts in the Turkish sample. A similar research can be carried out with studies with a foreign sample in order to reveal the existing understandings of these concepts abroad. Thus, it can be determined how the understandings regarding of the concepts differ between the Turkish and foreign samples.

Ethic

This study was conducted in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments.

Author Contributions

All stages of the study were organized and conducted by the authors.

Conflict of Interest

In the research, the authors declare no conflict of interest.

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The sources used in the study are indicated by the " * " sign.

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Exploring Pre-service Teachers' Perceptions of Teaching Profession Preferences and Teaching Status

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Abstract

The study was conducted with 230 pre-service teachers who study in different departments (Primary Education, Turkish and Social Studies Education, Mathematics and Science Education). This study aims to determine the perceptions of the professional preferences and teaching status of pre-service teachers studying in different departments. The correlational survey model was used as a research design. One-Way Analysis of Variance (ANOVA) and t-Tests were used to analyze the data. The current study discussed the professional preferences of the pre-service teachers in the dimensions of "intrinsic" and "altruistic", the dimensions of their professional status "teacher and the teaching profession value", "the importance given to the teaching profession" and "cases affecting the teaching profession". Pre-service teachers' teaching profession preferences and perceptions of teaching status were examined according to gender, department, and the place of living for a long time. Findings show that there are high levels of relationship between the reasons for choosing a teaching profession and the perceptions of professional status.

Key Words

Pre-service teachers • Teaching status • Teaching profession preference

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Concepts

Achieving social identity and educating a nation's new generations can only be achieved with teachers in a systematic way. Teachers, who have an education process following the requirements of the teaching profession, acquire intellectual competence with the necessary knowledge and skills, and who will serve the new generations with this knowledge and skill, play an important role in raising people who have adopted the culture, values, norms, and rules of the society. In addition, teachers, who have an important responsibility to provide the necessary education for the progress of society, are members of a profession as old as human history. The concept of "profession", which means a job carried out to earn money in return for serving with the qualifications based on systematic knowledge and skills gained through a certain education (TLA, 2019), means raising the human capital needed by the society in the teaching profession. Professions have the necessary skills to put them into practice. The professional skills needed for teaching are connected with the combination of knowledge and skills related to versatile and different disciplines (Hoyle, 2001).

Due to the transformation of teaching as a profession and the change in social needs in recent years, teachers should be equipped with new qualifications (Whitty, 2006; Lawn, 2011). Due to the changing nature of teaching, gaining the necessary features and perspectives in addition to the existing qualifications of the teaching profession is significant. Teacher training with state control is due to the need of societies to train the needed manpower. Persons who stand out in the teaching profession based on the understanding of professionalism and who will do this profession should have the specified characteristics. These features consist of having professional knowledge, professional skills, attitudes, and values. Professional skills include skills such as classroom management, measurement and evaluation, planning, and applying methods and techniques. Professional knowledge can be knowledge about providing education, knowledge of the professional field, legislation, and regulations. In addition, it is crucial because it adopts national, spiritual, and universal values, develops attitudes in the light of these values, and has characteristics that make people valuable (General Directorate of Teacher Training and Development, 2017). In addition, they must have the necessary qualifications in terms of academic, social, and personality traits. Having competence in the field, increasing intellectual accumulation, developing communication skills, developing social resilience and awareness, respecting different cultures, being attentive to universal and national values, thinking critically, having a universal thinking system, solving problems and conflicts, being open to innovations and able to adapt improvements and follow current developments (Hiebert et al., 2014).

The current study aims to investigate the pre-service teachers' preferences for the teaching profession and the perceptions of professional status and to reveal the relationship between them by utilizing measurement tools on the subject applied to the students. It is significant to investigate the factors in which the professional preferences of the measurement tools are formed, the factors affecting the choice of the teaching profession, and the level of relationship between professional status and professional choice. This study is essential for determining the current situation of pre-service teachers who study in the different departments of the faculty of education. When the relevant literature was examined, studies on choosing a profession has generally been evaluated in terms of economic factors, however, these studies examined whether it is suitable for individual interests and abilities (Hotaman, 2011; Wildes, 2004). Positive perceptions of professional status and professional preferences are effective in developing a person's belonging to the profession and determining professional performance.

Professional status, which represents the acceptance of the teaching profession in society, affects productivity by increasing the motivation of people who prefer this profession (Carless, 2005; Chellen & Nonkoo, 2010; Ehrahrt & Makransky, 2007; Sawyer, 2006,).

Professions have emerged as a result of the division of work required by the social, cultural, economic, technological, and political structure of societies. Professional groups, which are perceived differently in different societies and have various social statuses, are among the leading tools that determine the social position of people (De Wet, 2016). Social positions, roles, and values attributed to individuals are formed through statuses (Ceylan, 2011). Professional statuses, which are determined depending on economic conditions in societies, achieve different qualities with living conditions depending on their cultural and social characteristics. Among the most important factors affecting the perceptions of status in the teaching profession are good role models among teachers. In particular, the teacher model that students encounter during their first school years is the first impression that a person develops toward the teaching profession (Montecinos & Nielsen, 1997; Trujillo & Hardfield, 1999). While the status of the teaching profession is high in many societies, the meaning attributed to the teaching profession in our country is positive, but it is not considered at a high level as a professional status (Ünsal, 2018). Different factors affect professional status. Factors such as the working conditions and economic conditions of the profession can be given as examples.

Rationale and Purpose of the Study

This study aims to investigate the reasons for pre-service teachers' choice of the teaching profession and their perceptions of the status of the teaching profession and the relationship between them. In line with these purposes, the following research questions were formulated in the study:

RQ1: What are the pre-service teachers' preferences for the teaching profession and their perception of a professional status?

RQ2: What are the pre-service teachers' preferences for teaching profession?

RQ3: What are the pre-service teachers' perceptions of the teaching profession status?

RQ4: Do pre-service teachers' perceptions of teaching profession preference and professional status differ according to the variables of gender, department, and place of living?

RQ5: Is there a relationship between pre-service teachers' preferences for the teaching profession and their perceptions of professional status?

Method

Research Design

The current study analyzed the relationship between pre-service teachers' profession preferences and their perceptions of teaching status. The correlational survey model was used in the study. A correlational survey aims to investigate the state and level of change between two or more variables (Fraenkel et al., 2012).

Research Sample/Study Group/Participants

The study group consists of pre-service teachers who study at Çanakkale Onsekiz Mart University, Faculty of Education, in the spring semester of the 2021-2022 academic year. Sample selection was determined by a simple random sampling method. 250 pre-service teachers studying in the departments of Primary Education, Turkish and Social Sciences Education, Mathematics and Science Education. Incomplete and incorrectly filled data were excluded from the study, and analyses were carried out with 230 data. Demographic information about pre-service teachers is presented in Table 1.

Table 1

Demographic Information of Pre-service Teachers

Gender	**N**	**%**
Female	169	73.47
Male	61	26.52
The Place of Living	**N**	**%**
Village	35	15.21
Town	95	41.30
City center	99	43.04
Department	**N**	**%**
Primary Education	134	58.26
Turkish and Social Sciences Education	45	19.56
Mathematics and Science Education	51	22.17

When the sampling of the study is examined, 169 of the pre-service teachers (73.47%) are female and 61 (26.52%) are male. 35 of the pre-service teachers (15.21%) lived in the village, 95 (41.3%) in the town, and 99 (43.04%) in the city center for a long time. 134 (58.26%) of them are studying in the Department of Primary Education, 45 (19.56%) in Turkish and Social Sciences Education, and 51 (22.17%) in Mathematics and Science Education.

Research Instruments and Processes

This study investigated the relationship between the professional preferences of pre-service teachers studying in different departments and their teaching profession status. The Teaching Career Selection Reasons Rating Scale (TCSRRC) developed by Bursal and Burdur (2013), was applied to determine the teaching profession preferences of pre-service teachers. The scale consists of 2 dimensions, "altruistic and intrinsic", and 22 questions. The scale, which consists of 14 items for the first factor and 8 items for the second factor, was prepared in a 5-point Likert format. Perception Scale Towards the Status of the Teaching Profession developed by Meirkulova and Gelişli (2021), was also used to determine the perceptions of teaching status. The scale has three factors "teacher and the teaching profession value", "the importance given to the teaching profession", and "the cases affecting the teaching profession". The scale, which consists of 11 items for the first factor, 8 items for the second factor and 6 items for the third factor, was prepared with a 5-point Likert type scale.

Data Analysis

Incomplete and incorrectly coded studies were excluded from the 250 data by the researcher, and 230 data were included in the analysis. Analyzes were performed using the SPSS-23 program. The skewness and kurtosis values regarding whether the study data showed a normal distribution were examined.

Table 2

Kolmogorov-Smirnov Test on Pre-service Teachers' Scales of Profession Preference and Teaching Profession Status Perceptions

	N	Kurtosis	Skewness
Teaching Profession Preference Scale Scores	230	-.657	.319
Teaching Profession Status Perceptions	230	-.737	.329

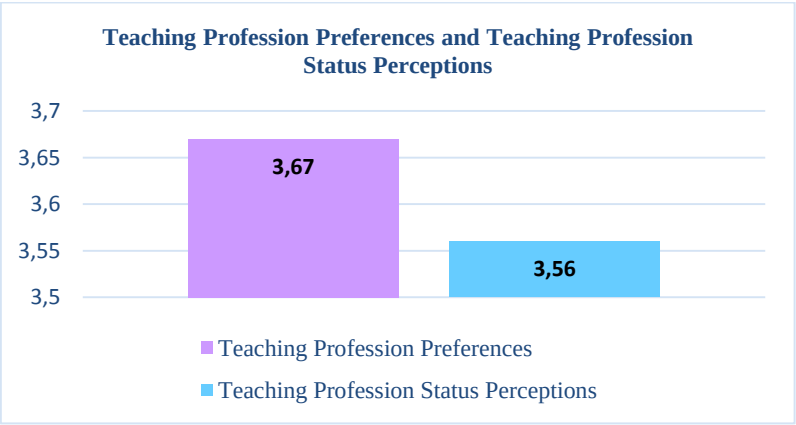
When Table 2 is examined, the normality assumptions, kurtosis, and skewness values of the data are shown. While the values were between -.627 and .319 in the teaching profession preference scale, the values about the status perceptions of the teaching profession were between -.737 and .329 and showed a normal distribution (Tabachnick & Fidel, 2013). The Correlation (Pearson) technique was utilised to identify the relationship between pre-service teachers' teaching profession preference and the perceptions of professional status. To test whether the perceptions of pre-service teachers' perception of profession preference and teaching status change according to gender, the t-Test was utilised. One-Way Analysis of Variance was conducted to analyze whether the pre-service teachers' perceptions of their profession preference and professional status differ according to the place of living and the department.

Results

Mean Scores of Teaching Profession Preferences and Statuses

Figure 1

Pre-service Teachers' Profession Preferences and Teaching Profession Status Perceptions



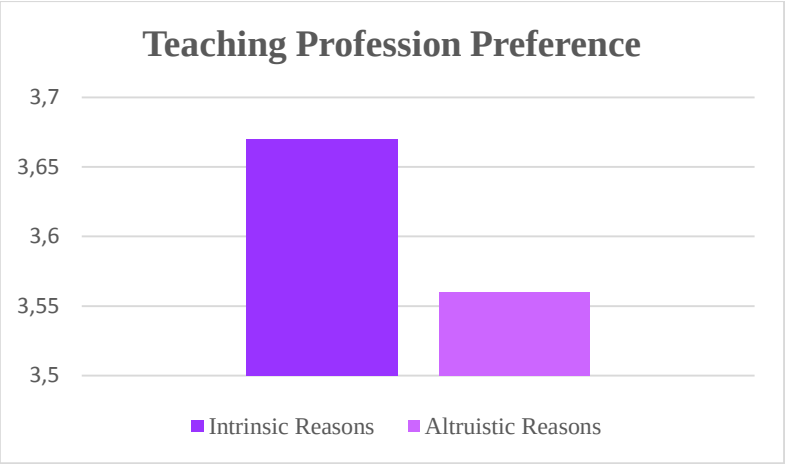
The pre-service teachers' profession preferences and their perception of the status of the teaching profession are above the mean and high. The mean score obtained by the pre-service teachers from the scale of teaching

profession preferences (M= 3.68) was determined as the scale mean score regarding the perception of the status of the teaching profession (M= 3.56).

Teaching Profession Preference

Figure 2

Teaching Profession Preferences of Pre-service Teachers

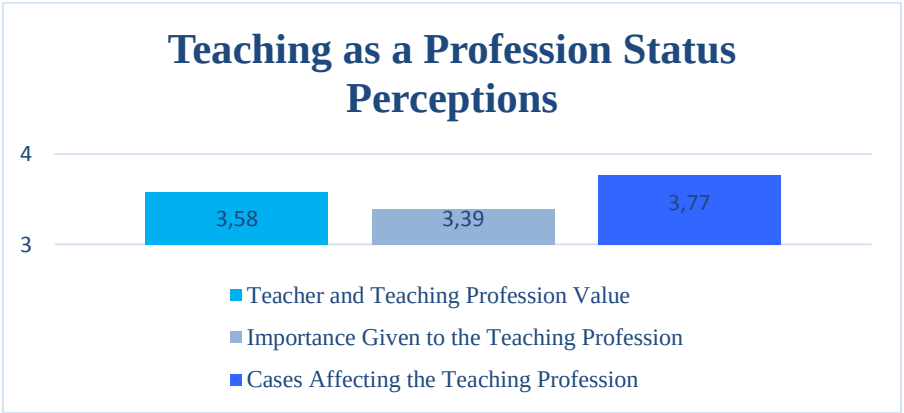


The reasons of preferring the teaching profession of the pre-service teachers were analyzed in two dimensions: "altruistic and intrinsic". Pre-service teachers have the highest scale point mean in the special reasons dimension from the scale of reasons for choosing a profession.

Teaching Profession Status Perceptions

Figure 3

Mean Scale Scores of the Status Perceptions of the Teaching Profession



The perceptions of the status of the teaching profession of the pre-service teachers were analyzed in three dimensions: "teacher and teaching profession value, importance given to the teaching profession, cases affecting the teaching profession". Pre-service teachers have the highest scale point mean in the dimension of issues affecting the teaching profession from the professional status perception scale.

Investigation of Perceptions of Teaching Profession Preference and Status in Terms of Different Variables

This part examined the pre-service teachers' profession preferences and perceptions of teaching profession status according to gender, department, and place of living. Findings are presented in tables below.

Table 3

T-Test for Pre-service Teachers' Perceptions of Professional Preference and Status by Gender

	Gender	**N**	**M**	**S**	**sd**	**t**	**p**
Profession Preference	Female	169	3.78	.822	228	3.20	.005
	Male	61	3.38	.842			
Teaching Status	Female	169	3.65	.763	228	2.81	.002
	Male	61	3.32	.857			

*** p < .05*

The t-Test results found a significant difference between the mean scores of the pre-service teachers regarding their professional preferences and perceptions of their teaching status according to gender. The mean score of the female-service teachers from the reasons for choosing a profession rating scale (M=3.78) was higher than male pre-service teachers (M=3.38). The mean score of the female pre-service teachers from the perception scale of their teaching status (M=3.65) was higher than male pre-service teachers (M=3.32).

Table 4

ANOVA Test for Pre-service Teachers' Perceptions of Profession Preference and Status According to the Department

	Variance	Sum of squares	Mean squares	sd	F	p	Significance
Professions Preference	Between groups	12.434	6.217	2	9.352	.00	Primary Education/ Turkish and Social Sciences Education Primary Education/ Science and Mathematics Education
	Within-group	150.909	.665	227			
	Total	163.343		229			
Teaching Status	Between groups	13.361	6.681	2	11.333	.00	Primary Education/ Turkish and Social Science Education
	Within-group	133.813	.589	227			
	Total	147.174		229			

*** p < .05*

There was a significant difference between the scale scores of the pre-service teachers' profession preference [F(2,227)= 3.69] and their perception of teaching profession status [F(2,227)= 3.56] according to their department. According to Games Howell test, which was used to analyze which groups of the pre-service teachers had a significant difference in their profession preferences. The mean expression (M=3.87) of the pre-service teachers studying in the primary education department were higher than the others. According to the

Scheffe test, which was applied to determine between which groups the pre-service teachers' perceptions of teaching status were significantly different, the scale score mean of the pre-service teachers studying in the primary education department (M=3.75) were higher than the other pre-service teachers.

Table 5

ANOVA Test for Pre-service Teachers' Perceptions of Professional Preference and Status According to the Place of Living

	Variance	Sum of squares	Mean squares	sd	F	p	Significance
Profession Preference	Between groups	6.200	3.100	2	4.47	.018	City center-village
	Within-group	157.143	.692	227			
	Total	163.343		229			
Teaching Status	Between groups	5.11	2.556	2	4.08	.012	
	Within-group	142.06	.626	227			
	Total	147.17		229			

*** p < .05*

According to the place of living of the pre-service teachers, there was a significant difference between the scale scores of the reasons for choosing the teaching profession [F(2,227)= 3.67] and the perception of the status of the teaching profession [F(2,227)= 3.56]. The results of the Games Howell test show that the scale score mean of the pre-service teachers living in the city center (M=3.88) were higher than the other pre-service teachers. The Games Howell test shows the pre-service teachers' perceptions of teaching status were significantly different, and the scale score mean of the pre-service teachers living in the city center (M=3.83) were higher than the others.

Investigation of the Relationship Between Perceptions of Teaching Profession Preference and Status

This part revealed the relationship between the pre-service teachers' reasons for preferring the teaching profession and the mean score of the general and sub-dimensions of their perception of professional status by calculating the Pearson Product Moments Correlation coefficient. The results of the analysis are presented in tables below.

Table 6

Teaching Profession Preference and Perceptions of Profession Status Correlation Analysis Results

	Profession Preference	**Teaching Profession Status Perceptions**
Profession Preference	1	.775**
Teaching Profession Status Perceptions	.775**	1

A simple linear correlation analysis was used to determine whether there is a significant difference between the reasons for choosing the teaching profession and the perceptions of the teaching status of pre-service teachers. There is a significant and positive relationship between pre-service teachers' perceptions of their profession preference and teaching status (r=.775).

The Pearson Product Moments correlation coefficient analyzed the relationship between the reasons for preferring the teaching profession regarding the sub-dimensions and the general score mean of the perceptions of teaching status. The results of the analyzes are presented in Table 7.

Table 7

The General Mean of Reasons for Preferring the Teaching Profession and the Results of Correlation Analysis of Scale Scores Related to the Dimensions of Perceptions of Teaching Status

		Profession Preference
Teaching Status	Teacher and Teaching Profession Value	.706**
	The Importance Given to the Teaching Profession	.658**
	Cases Affecting the Teaching Profession	.723**

According to the simple linear correlation result conducted to analyze the relationship between pre-service teachers' teaching status sub-dimensions and the reasons for preferring the teaching profession, the most significant relationship was between teaching status and teaching profession preferences is in the dimension of "cases affecting the teaching profession". A significant relationship was also found in all sub-dimensions.

Pearson product-moment correlation coefficient was examined to investigate the relationship between the overall score mean regarding the sub-dimensions perceptions of teaching status and the reasons for choosing the teaching profession. The results of the analyzes are presented in Table 8.

Table 8

The Results of Correlation Analysis of the General Mean of Perceptions of Teaching Status and Scale Scores Related to the Dimensions of Teaching Profession Preference

		Teaching Status
Profession Preference	Intrinsic Reasons	.766**
	Altruistic Reasons	.748**

As a result of the simple linear correlation process, the most significant relationship between teaching status and teaching profession preferences was in the intrinsic reasons, while a significant relationship was found in all sub-dimensions.

Table 9

Profession Preference and Teaching Status Scale Scores Correlation Analysis Results

	Intrinsic Reasons	**Altruistic Reasons**
Teacher and the Teaching Profession Value	.702	.673
The Importance Given to the Teaching Profession	.645	.642
Cases Affecting the Teaching Profession	.713	.700

Table 9 shows the relationships between pre-service teachers' teaching profession preferences and the dimensions of their perceptions of professional status. The highest correlation was found between the dimension of "cases affecting the teaching profession" of the status perceptions of the teaching profession and the "intrinsic

reasons" dimensions of the teaching preference scale (r:.713). The lowest correlation was found between the "importance given to teaching profession" dimension of the status perceptions of the teaching profession and the "altruistic reasons" dimensions of the teaching preference scale (r:.642).

Discussion, Conclusion & Suggestions

The mean scores of the pre-service teachers on the scale of reasons for preferring the teaching profession were at a high level. Pre-service teachers studying in various departments have higher scores in the dimension of intrinsic reasons, which is among the reasons for preferring the teaching profession. It is related to the fact that the qualifications suitable for the requirements of the teaching profession, which is expressed as the intrinsic reason, are suitable for the individual characteristics of the individuals. The reasons that pre-service teachers consider for preferring the teaching profession is important in terms of they love teaching, they want to reflect the ideal teacher characteristics, and the individual characteristics of the pre-service teachers. Similarly, Şener and Gündüzalp (2020) investigated the reasons for the teaching profession preferences of students who received pedagogical formation for the teaching profession. Their research was carried out on the reasons for preferring the teaching profession. They argued that factors such as finding himself successful in teaching, love of children, being a teacher in his dream job, and the fact that teachers' working conditions are more comfortable than many other professions are effective in the choice of teaching. Montecinos and Nielsen (1997) argued that the reasons why pre-service teachers prefer the teaching profession are that they encounter role model teachers who left positive and impressive traces in the past. Different from the results of the previous study, Saylan et al. (2020) noted that environmental reasons are effective in pre-service teachers' profession preferences. Yılmaz and Doğan (2015) highlighted that the reasons for choosing the teaching profession are related to the characteristics that teachers should have, which can be expressed as intrinsic reasons, and their characteristics are compatible with each other and their competence in innovations suitable for current developments. Similarly, Irsaliev et al. (2019) conducted a study on why young people choose the teaching profession. According to the research findings, many people show interest in the teaching profession, that it is perceived as a positive social status, and that the teaching profession requires development and change that will allow the person to develop himself. Chakraborty and Modal (2014); Musa and Bichi (2013) examined the of pre-service teachers attitudes on the teaching profession and concluded that pre-service teachers' attitudes on the teaching profession are positive. Everton et al. (2007) indicate that the preferences of the teaching profession are related to the fact that the profession is respected by all segments of society.

According to the findings, pre-service teachers have high perceptions of their teaching profession status. When the sub-dimensions were examined, the mean score of the scale in the dimension of "cases affecting the teaching profession" was higher. It is argued that the effects of this are due to reasons such as the individual characteristics of the people who will make a teaching profession are suitable for the teaching profession, and the teaching profession is open to the development and change of professional skills in many fields. Dolton and Marcenaro-Gutierrez (2013) examined teacher status characteristics in different countries and concluded that the teaching profession has a high status characteristic as a social acceptance. Özdemir and Orhan (2019); Doğan (2018) stated that according to teachers' views, the perception of the status of the teaching profession is negative compared to previous years, the prestige of the teaching profession has been lost and the professional image has

become worse. Concerning this, the new regulations on the authority and duty areas of the teaching profession have an impact. Hargreaves et al. (2007) highlighted that in many countries, perceptions of the status of the teaching profession have changed negatively, and accordingly, the former importance of the teaching profession has disappeared.

According to Yurdakal (2019), the image of teaching and the profession respected by society are effective in the choice of profession of pr-service teachers. Ulutas (2017); Bek (2007) examined the social roles and status of teachers in their studies and noted that roles such as social changes and orientation to the environment are taken in a broad framework. Despite this, they stated that teachers' perception of status is low.

Female pre-service teachers' perceptions of teaching profession preference and teaching status were higher than male pre-service teachers. Related to this case, Çelenk (1988), Saracaloğlu (1991), and Demirci and Soran (2001) found that female pre-service teachers have more positive perspectives toward the teaching profession. İpek (2015) also added that female teachers do this by assimilating into the teaching profession more and establishing a strong bond. Some studies argue that teaching preferences do not differ according to gender (Musa & Bichi, 2013; Korkmaz, 2009), which is different from the results of the study.

The pre-service teachers' perceptions of profession preference and professional status who study in the department of early childhood education were higher than the pre-service teachers' education in other departments. First of all, female teachers with mother characteristics are suitable for teachers working at the class level with younger students. However, there are effects such as diversity in early childhood studies and the opportunity to work interdisciplinary, and the diversity in terms of different studies and courses. Hall and Langton (2006), who reached different results from the study, prepared a project on teaching status. They concluded that the status perceptions of the teaching profession are low, and the perceptions of teaching status are higher for secondary education teaching and lower for pre-school teaching.

The profession preference and teaching status perceptions of the pre-service teachers living in the city center for a long time are higher than the pre-service teachers living in the town and village. Yaman et al. (2013) analyzed the socioeconomic status of the teaching profession in the social structure in their research and found that the perception of the professional status of pre-service teachers living in big cities is higher. The result can be related to the high number of good teacher examples encountered by pre-service teachers living in the big city and the number of teachers in the family environment.

The positive and significant relationship was found between pre-service teachers' professional preferences and their perception of teaching status. People with positive perceptions of teaching profession status are more likely to choose teaching as a priority in their profession preferences. This can be related to the examples and experiences that create positive attitudes on the teaching profession. According to Aydemir (2021) identified a positive and significant relationship between the attitudes of pre-service teachers about the teaching profession and their level of altruism. According to the results of the study, there is a relationship between the reasons for choosing teaching and perceptions of professional status, and the profession, events, and situations that are accepted in the society are more exemplary, and therefore, the probability of students to choose the teaching profession increases. For this reason, it is significant to determine the professional status perceptions of pre-service teachers and to reveal the expectations and dreams of the society for the teaching profession. Therefore,

the study can be carried out with the students of the education faculty of a university in a city with different characteristics. Determining which pre-knowledge pre-service teachers make their preferences while choosing the teaching profession will update the educational content to be presented to pre-service teachers, and will enable the presentation of programs and training that will cover the developments of the age in this field. In this context, future research can be done on the reasons for choosing the teaching profession, and perceptions of professional status should be made by qualitative research by conducting in-depth interviews with students.

Ethic

The study was approved Çanakkale Onsekiz Mart University School of Graduate Studies on 14.04.2022 within the scope of the decision numbered "08/41" for the study titled "Exploring Pre-service Teachers' Perceptions of Teaching Profession Preferences and Teaching Status" with the number of 2022-YÖNP-0294.

Author Contributions

All of the authors have contributed equally to this article.

Conflict of Interest

The authors declare there is no conflict of interest in this study.

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Research Article

The Views of Special Education Teachers on a Mobile Writing Application

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Abstract

Students' acquisition of writing skills plays a key role in their academic life. Approximately half a normal school day is covered by writing activities. Although writing is such an important skill in education, there are students who have difficulties. One of the specific learning disabilities, dysgraphia, can be defined as writing impairment. Educational technology is a promising solution for students with dysgraphia. Mobile devices in particular offer a wide spectrum of opportunities for students with dysgraphia to learn with their unique qualities. The main purpose of this study is to reveal the views of special education teachers on a mobile writing application after its use. Previous studies have developed a mobile writing application (Hopcan et al., 2019) and examined its effectiveness (Hopcan & Tokel, 2021). In this current study, a qualitative method was used to reveal the views of special education teachers on the mobile writing application after its use. Semi-structured interviews were conducted on the application with seven special education teachers. Teachers perceived the mobile writing application as easy to use. In addition, teachers found the application useful in terms of improving students' writing skills, teaching how to write accurately, and maintaining students' attention more than traditional writing practices. They perceived the mobile writing application as enjoyable for students. Some of the teachers had suggestions for improving the application.

Key Words

Dysgraphia • Mobile technologies • Handwriting

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Writing, an indispensable part of school life, has an important place in students' lives. The inevitability of handwriting applies to both school and beyond (Chicu et al., 2014). Akyol (2005) defines writing as a process of producing required symbols and signs through using motoric skills in order to express thoughts. In this context, acquisition and development are two stages of writing instruction. The acquisition process involves teaching how to write basic components such as letters, syllables, words and sentences in the first three years of school life. Approximately 50% of a normal school day covers writing activities (McHale & Cermak, 1992). Based on this, acquiring writing skills of students plays a key role in their academic life.

Although writing is such an important skill in education, there are students who have difficulties in writing. Dysgraphia, which is related with handwriting problems, is one of the specific learning disabilities (Parastar Feizabadi et al., 2013). American Psychology Association (APA, 2013) defines dysgraphia or impairment in writing as having difficulties in written expression. The rate of students with writing difficulties have been determined by research as follows: 10% (Maeland, 1992), 12% (Rubin & Henderson, 1982), 5% (Hamstra-Bletz & Blöte, 1993), 22% (Smits-Engelsman et al., 1995), 34% (Smits-Engelsman et al., 2001), and 13% (Karlsdottir & Stefansson, 2002). Alston (1985) also stated that 21% of secondary school students have writing disabilities. Studies on writing disabilities appear to extend on a spectrum that ranged between 5% and 34%. This number is increasing day by day and these students show common characteristics: Illegibility in handwriting (Alberta Learning and Teaching Branch, 2002; Chung & Patel, 2015; Richards, 1998), switching to cursive and print handwriting, spending too much time thinking about which words to write, and problems with sentence completion (Chung & Patel, 2015; Richards, 1998), confusing uppercase letters with lowercase letters and writing them alternately, errors in writing letters, incompleted (cursive) letters, irregular letter size, and shape (Reid et al., 2015; Richards, 1998). Furthermore, they have tight pencil grip (Alberta Learning and Teaching Branch, 2002; Richards, 1998), problems with body position, organization problems, slow writing (speed problems), and copying (Alberta Learning and Teaching Branch, 2002; Richards, 1998) becoming distracted while writing, an inability to adjust letter size, lines, and margins (Richards, 1998), spelling, grammatical, and punctuation errors (Yiğiter, 2005), poor performance in written assignments and exams, and reluctance in writing (Alberta Learning and Teaching Branch, 2002). Educational technology is a promising solution to meet the needs of students with dysgraphia. Mobile devices in particular offer a wide spectrum of opportunities for students with dysgraphia to learn with their unique qualities. By using mobile technologies, students can study independently of time (Evans, 2008; Kagohara et al., 2013) and place (Evans, 2008). Mobile devices have many advantageous features such as design, accessibility, ease of acquisition, mobility, touch screen interaction through motion, and connectivity (Fernández-López et al., 2013). In the literature, there is little research focusing on the development of technologies for writing (Czyzewski et al., 2009; Diah et al., 2012; Giordano & Maiorana, 2014); there remains a gap in the literature about the use of mobile technology for students with dysgraphia.

Diah et al. (2012) carried out a study with children between the ages of four and six who have writing difficulties. Computer assisted software (AJaW) was developed based on Hannafin and Peck Instructional Model to demonstrate how to grip a pencil, pre-writing activity, practices, and evaluation for motor-skills development by using a graphic tablet. AJaW was tested in terms of appearance, learnability and scaffolding. The results revealed that students found AJaW enjoyable and they were able to improve their motor skills. The software has been developed for helping students master complex writing skills.

A web-based, platform-free educational software that is usable with tablets and smartphones, for students with dysgraphia was by developed by Giordano and Maiorana (2014) based on a gesture recognition algorithm. Different types of writing exercises and feedback were presented by the software. Also the data taken from users was recorded and enabled real time statistics for individualized learning. The software has continued to be used to test its effectiveness and other aspects on dysgraphic students.

Czyzewski et al. (2009) created a smart pen system providing students with dysgraphia opportunities to practice their writing skills with a teacher or therapist. The findings of the study indicate that both teacher and students enjoyed using the system.

In Turkish literature, there is growing research on different aspects of writing and writing disabilities. Yet, studies about educational technology used in writing disabilities (dysgraphia) are very limited. Only an Android application was developed by Yılmaz (2014). It is recommended to be used in the education of students with writing disabilities. In another study, a mobile writing application was developed (Hopcan et al., 2019) and its effectiveness was examined (Hopcan & Tokel, 2021). There was an improvement in students' writing skills after using this application (Hopcan & Tokel, 2021). This study explores the views of special education teachers whose students participated in the experimental study. These teachers occasionally observed students from the outside while they were using the application. To this end, the main purpose of the study is to reveal the views of special education teachers on the mobile writing application after its use.

Method

Research Design

This study used a qualitative method in order to reveal the views of special education teachers on a mobile writing application after its use. Previous studies developed a mobile writing application (Hopcan et al., 2019) and examined its effectiveness (Hopcan & Tokel, 2021). In the current study, one-to-one semi-structured interviews were conducted on the mobile writing application with special education teachers.

Participants

The participants of this study were selected using purposeful sampling. Special education teachers whose students participated in the experimental study were included. All of them work in Istanbul. These participants were chosen for this purpose. Semi-structured interviews were conducted with seven special education teachers (see Table 1).

Table 1

Information about the Special Education Teachers

Code	Gender	Age	Experience
ST1	Female	26	2 Years
ST2	Male	70	49 Years
ST3	Male	29	8 Years
ST4	Male	60	41 Years
ST5	Male	23	6 Months
ST6	Female	24	2 Years
ST7	Female	27	5.5 Years

Instruments

Semi-structured interview protocol: For in-depth analysis of the application, a semi-structured interview protocol was given to the special education teachers. It consisted of five questions and seven sub-questions. A semi-structred interview form included questions such as: "Can you describe what you think of the use of the application and stylus pen for students?, "If you were to consider using a mobile application to teach other knowledge and skills, what would they be?", "What are the benefits of the application for students?"

Mobile writing application: This application, which uses a gesture recognition algorithm, was developed for Android devices. The content of application includes both uppercase and lowercase letters, syllabi, words and numbers (Figure 1). The duration of study, the percentage of correct writing, correct uppercase and lowercase letters, incorrect uppercase and lowercase letters, correct and incorrect numbers, correct and incorrect syllables, correct and incorrect words (Hopcan & Tokel, 2021, p.6) were logged in a database. A flow chart of mobile writing application is prensented in Figure 2.

Figure 1

Some Screenshots from the Application: Lowercase Letters, Uppercase Letters, Numbers, Syllables, and Word Parts Respectively

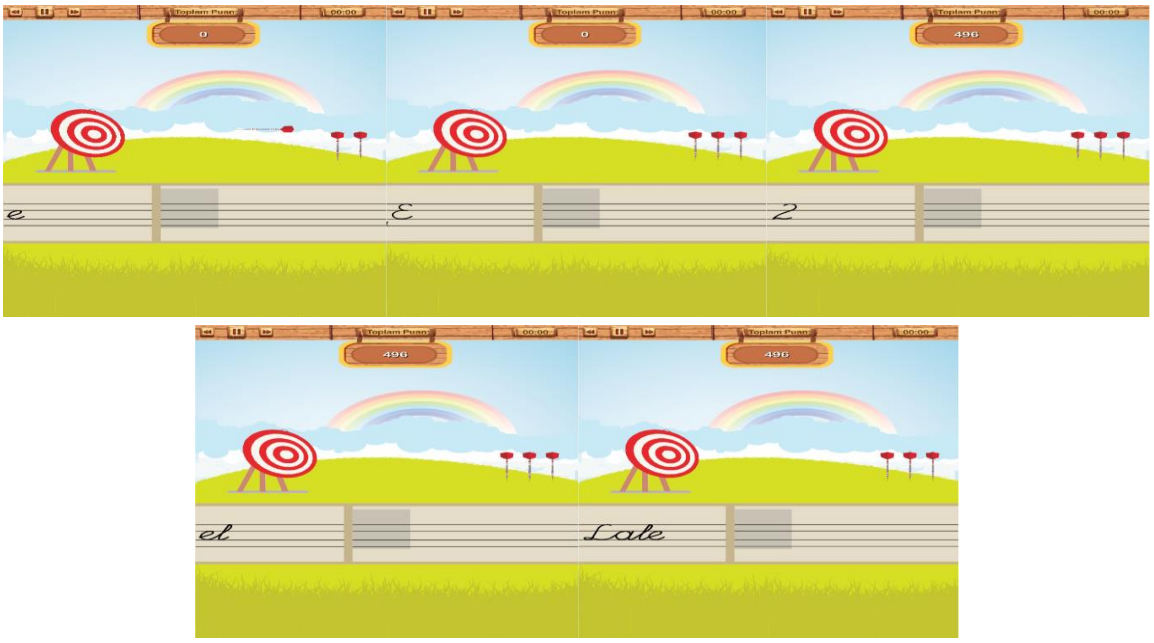
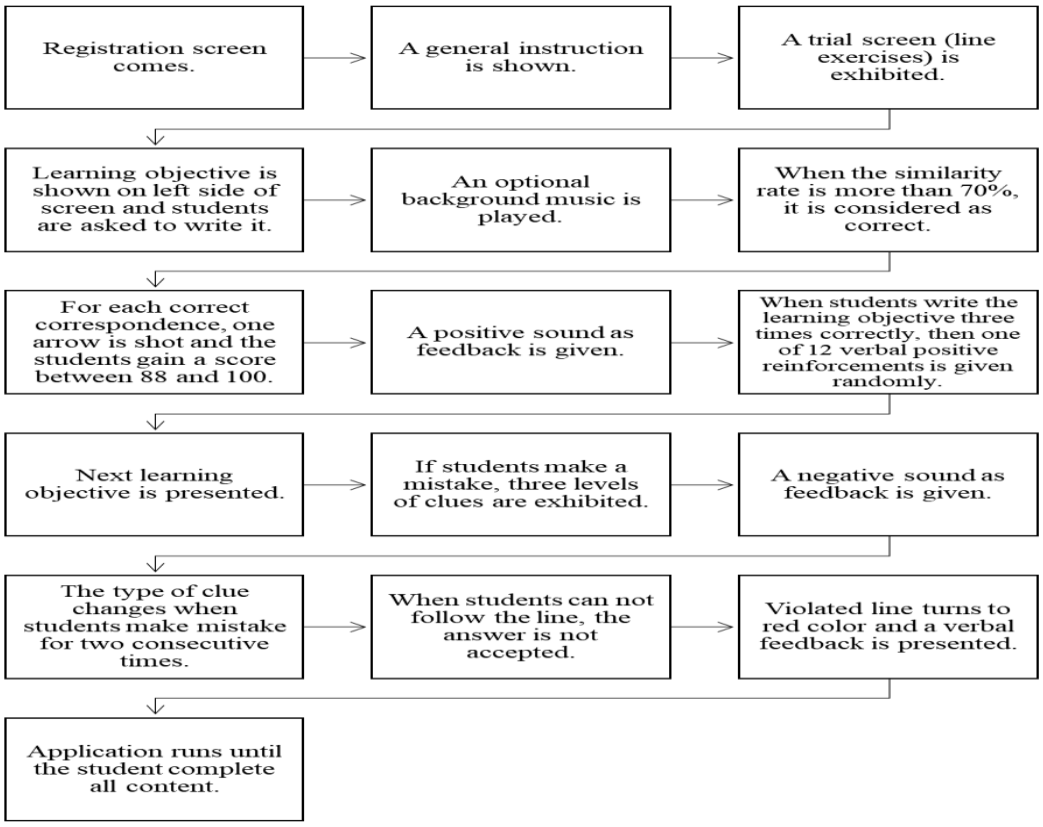


Figure 2

Flow Chart of Mobile Writing Application



Procedures

In this study, a semi-structured interview protocol was given to the special education teachers. Each interview took approximately 20 minutes.

Data Analysis

Interview data was examined using content analysis. Content analysis attempts to reveal concepts that can explain data. Through content analysis, we try to identify the data and reveal the truths that may be hidden within the data (Yıldırım & Şimşek, 2013).

Reliability and validity issues

Inter-coder reliability was defined as the agreement of different researchers about the codes on the same text. In addition, for inter-coder agreement the researcher should find another experienced researcher to cross check their codes (Creswell, 2013). The researcher worked with a research assistant from the same field in this step. She is experienced in qualitative research and a Ph.D. candidate. She was informed about the study in a detailed manner. Miles and Huberman's (1994) formula was employed to calculate inter-code reliability score. Inter-coder reliability equals the number of agreements divided by the sum of the number of agreements and the number of disagreements. In this study, the inter-coder reliability score was found to be *.84* using this formula. According to Miles and Huberman (1994), *.80* is a good score.

Thick Rich Description is one of the validity strategies in qualitative research. Researchers should use rich description in their study to convey the results (Creswell, 2013). The current study provides detailed information about the participants and settings. Creswell and Miller (2000) state that thick description gives other researchers transferring opportunity to their research contexts in order to establish credibility.

Peer debriefing or peer review is another validity strategy used in this study. Peer debriefing means that reviewing the research process by a peer reviewer who is familiar with the whole research process. In addition, peer debriefing enables researchers to add credibility to their research (Creswell & Miller, 2000). In the current study, three field experts provided reviews and gave support through all steps of the research as peer debriefers.

Disconfirming evidence is used to add credibility to the study. Creswell (2013) emphasizes that in order to establish credibility, researchers should discuss negative information as well. This is important because there are different perspectives and contradictory views in real life. By discussing contrary evidence, researchers can present their results in a more realistic and more valid way. The current study presents disconfirming/negative information as well as confirming/positive evidences.

Results

Special education teachers' views were examined following five themes: 1) perceived ease of use, 2) perceived usefulness, 3) perceived enjoyment, 4) aspects that need to be improved, and 5) future use.

Perceived Ease of Use

All interviewed teachers (n=7) perceived the mobile writing application as easy to use. One of them (ST1) stated that students were familiar with tablet:

"All of them were very familiar with the tablet already. In fact, initially it was something children were not familiar with [stylus pen]. The children had difficulty due to the fact that they had not used a digital pen before. However, it did not take long and they got used to it in two minutes. I think it was nice to use."

Similarly, another teacher (ST2) claimed that even a small child can use it easily: *"It is not difficult. It is an applicable project to the students. Students could use it in the spring term of the first grade."*

One teacher (ST3) stated that writing on a screen is easier than writing on a paper: *"Actually, it is easy to use for students. So writing on a tablet is better than writing on paper. Moreover, the screen is [slippery]."*

Another teacher (ST6) thought that the application ensures the ease of use with feedback and reinforcements: *"Children were guided by the application. For example, it gave feedback when (s)he made a mistake or it rewarded when (s)he earned it."*

Most of the teachers (n=4) found the stylus pen easy to use, but three of them had some concerns. For example, one teacher (ST2) stated:

"I think the pen sometimes got stuck, did not it? Did it prevent children to study serially? But if it can be improved, a pen which is more slippery and easier, children will be more successful."

ST3 discussed that there can be problems with the pen holding positions: *"Children must be able to begin the [writing] process when (s)he puts the pen [on the screen]. Children should not have to think: 'let's grip pen this way, let's grip pen that way'."*

ST5 suggested a pen with a small tip: *"I think the thing on the tip of the pen is not very practical. Being transparent increases practicability, it is an advantage. But we could try it with other pens with a small pointed tip."*

Theme: 1) Perceived ease of use

Teachers' Views

- The mobile application was easy to use because:
    - The students were familiar with tablet.
    - Even a child who was in 1st grade and second term can use it easily.
    - Writing on a screen is easier than writing on paper because the screen is more slippery.
- Students have never used a stylus pen; however, they got used to use it easily in a short time.
- Some of the teachers had concerns about the use of the stylus pen:
    - Pen holding positions should not be a problem for students.
    - A pen with a small tip was suggested.

Perceived Usefulness

All interviewed teachers (n=7) perceived mobile writing application as useful for students with dysgraphia from different perspectives.

Two of teachers (ST1 and ST3) claimed that the mobile writing application makes writing more interesting than paper-pencil. Therefore, mobile applications are more useful. For instance, ST1 said: *"I found it very good. It was interesting for children because of using a different thing instead of paper-pencil."*

In the same way, ST3 stated: *"They used to get bored before. Now, they ask to write [on the tablet] themselves."*

Moreover, teachers pointed out other useful aspects of the mobile writing application. ST1 deduced in a traditional writing class, teachers cannot be aware of mistakes in writing direction:

"For example, children need to return to some point while they are writing "a". I did not notice it, since I did not know this issue much. In fact, the cause of difficulty while writing was that the child could not write the letter accurately. However, your application gave feedback when the child did not return from the half of the letter. And (s)he had to do it again."

Correspondingly, ST3 believed that learning writing direction leads to accurate writing: *"At least, I think, they learned the writing directions of letters. They can use [write] them correctly."*

ST1 addressed usefulness from the perspective of not only allowing monitoring but also improving writing skills:

"I think it is very nice for monitoring children, for monitoring where their mistakes are. Thereafter, for example, now I am looking at my students' writing, they have improved more. Even, I thought it'd be much better if students write their assignments in [application] [she laughs]."

ST1 compared the application and the notebook in terms of the number of pages: *"We have to give some students activities of dozens of pages. It seems long to him/her but in the tablet [application] does not seem long. Therefore, it is good."*

All of the teachers believed that the mobile writing application was useful for improving students' writing skills. ST3 believed that the application improved writing skills of students more accurately:

"I think that the students develop their writing [skills] because they usually write without knowing. But this application shows them how to write beforehand, when children make a mistake, [mobile application] shows the mistake to them so I think it is useful."

ST3 thought the application's use of visuals made learning permanent:

"Besides, when [writing] is on the tablet, it is more permanent for the child. Well, icons are very important for us. Visualization is very important. If there is visualization, it will always be in the child's mind."

ST5 claimed that the writing application encourages more concentration than paper-pencil sessions: *"Considering they [children] could study for a long time, they are motivated. Normally they would not be."*

ST6 stated that visual and audio elements facilitated learning to write: *"So, since the child was presented with both auditory and visual stimulus, both writing and learning were easier. I think it is a good application."*

Moreover, ST2 emphasized that the application facilitates teacher's teaching activity: *"I would definitely use this application because instead of holding the children's hand and dealing with writing, using the tablet [is easier]. The application tells [how to write]."*

ST5 stated that the application's hierarchical clue system was great and it was also inspiring for special education field:

"I think it is a good thing because at first [children] see [the learning objective] clearly. Children were trying to do it, if they could not, [the application] gave them hierarchical clues."

Likewise, ST7 acknowledged the application was effective because of its feedback system: *"Because applications which tell the students their mistakes such as 'you overflowed the bottom line, you overflowed the top line etc.' it is particularly more effective"* and she added: *"So, as I said, making the lessons enjoyable, concretizing, correcting the mistake of the students [were advantages]."*

Theme: 2) Perceived usefulness

Teachers' Views

- The mobile writing application was useful because:
    - It makes writing more interesting than paper-pencil.
    - In a traditional writing class, teachers cannot be aware of mistakes in writing direction and learning writing direction leads to accurate writing.
    - It allows monitoring.
    - It improves writing skills.
    - Unlike traditional writing activities, there is not too many pages in mobile writing application.
    - It allows students to write more accurately.
    - Using visuals in the application made learning permanent.
    - It ensures better concentration than paper-pencil sessions.
    - Visual and audio elements facilitated learning to write.
    - It facilitates teacher's teaching activity.
    - The hierarchical clue system used is effective.
    - It has an effective feedback system.

Perceived Enjoyment

All participants perceived the mobile writing application as enjoyable for students with dysgraphia except for ST5. For example, ST1 stated: *"In fact, many of them had fun. They stressed that they should beat other children. But in fact they enjoyed it when they were away from stress themselves."*

Two of the special education teachers (ST3 and ST6) claimed that the mobile writing application was enjoyable such that students came to the special education center just because of this application. For example,

they stated (ST6 and ST7 respectively): *"We witnessed children coming to school to use this application because they had much fun..." "They had fun so they never complained. They did not say that we were bored or something. They might even come for application."*

Similarly, ST7 stated: *"We could see that they were more willing to come, it sounded fun. They were smiling most of time"* and added: *"For example, if you apply it at schools, I think you would ensure more participation."*

ST6 and ST7 claimed that this application made writing enjoyable for students. For example, ST6 stressed: *"Sometimes, writing can be boring for children. However, we make it [writing] with gamification. Besides, using both visuals and sounds are fun for children."*

ST1 and ST3 suggested the application was like a game. For example, ST1 stated:

"It does not seem like a course; it is seen by everyone as a game. A child finished all the words [in the application], who has difficulties with writing when I gave a paper to write to him/her."

Similarly, ST3 thought: *"It was usually presented as a game; I think they loved it [writing]."*

ST5 did not perceive the mobile writing application as enjoyable because of the fact that games did not come after every accomplished goal:

"Since there is a teacher in traditional setting, s(he) can make other activities. However, it is not like that in the tablet. Well, can it be? Absolutely, doable… I think it would be much more fun after children write "a" sound correctly, a game presents as a reward from the tablet automatically."

Theme: 3) Perceived enjoyment

Teachers' Views

- The mobile writing application was enjoyable because:
    - Students had fun.
    - Students came to special education center just because of this application.
    - Application made writing enjoyable for students.
    - It is like a game.
    - It is perfectly appropriate for students with dysgraphia.

Aspects that Need to be Improved

ST4, ST5, and S6 claimed that there is no need to revise/modify any part of the writing application. On the other hand, some of teachers had some suggestions. As mentioned previously, ST2 and ST3 suggested improving the use of the pen.

ST1 recommended that there should be a line on the animation screen:

"I said one thing. There was a text in the animation part [clue]. The letter was just on a blank space. If it was on a line like in the beautiful writing pad, they would have seen the [line] spacing."

ST7 suggested that the application should be more accurate: *"[The application] accepted some letters as correct when [students] wrote a similar letter. For instance, when a student wrote 'k' instead of 'h' it [the application] accepted it as correct."*

ST3 stated that students should be given rewards at every stage of the application for reinforcement: *"Children in general, you know, want a reward at the end. I think there can be a reward for every accomplished mission."*

Theme: 4) Aspects that need to be improved

Teachers' Views

- The use of the pen should be improved.
- There should be a line on the animation screen.
- The application should be more accurate.
- Students should be given rewards at every stage of the application as a reinforcement.

Future Use

All participants (n=7) wanted to use the mobile application for educational purpose. ST1, ST3, ST5, and ST7 underlined that the educational mobile application gets children's attention. For example, ST7 stated: *"Now, when a teacher only lectures, it is boring. They [the applications] prevent boredom and get children's attention."*

Besides ST5 deduced that getting children's attention can lead to more focus: *"All technological tools are interesting for children. Children can be more concentrated because of that."*

ST7 stated that educational applications provide the most updated information: *"Also, some of the information is updated. They [educational applications] are more accurate."*

In addition, teachers (ST1, ST3, and ST5) emphasized that as we are in an era of technology, we need to take advantage of mobile educational applications. For example, ST1 stressed: *"It does not work with paper-pencil because we live in the technology age. We have to move on mobile applications compulsorily."*

ST1 emphasized that mobile applications provide proper and easy monitoring of work:

"At first, monitoring is very easy. I have to have a lot of paper here; I have to group them according to students. There is not anything like that in the mobile applications. I know how much progress he/she made."

ST3, ST5, and ST6 emphasized the importance of using visuals. For example, ST3 stated: *"Papers are always black and white. You know the photocopies. Usually colored stuff attracts the attention of children."*

Similarly, ST6 emphasized the role of visualization in learning: *"Visualization always facilitates learning more. Therefore, the child sees and writes at the same time. Many senses of her/him work at a time."*

ST4 claimed that educational applications reduce children's mistakes with immediate feedback: *"The mobile application reduces mistakes a little. Children can see their mistakes easier and earlier. It would be nice in terms of good writing."*

ST3 thought that educational applications can help teachers: *"They are practical and useful for teachers."*

Theme: 5) Future use

Teachers' Views

- All teachers want to use mobile application for educational purpose because:
    - It gets children's attention which leads them to focus more.
    - Educational applications provide the most updated information.
    - The use of mobile applications could bring many advantages in the era of technology.
    - It provides proper and easy monitoring of work.
    - Using visuals is very important for learning.
    - The educational applications reduce the mistakes of children with immediate feedback.
    - The educational applications can help teachers in many ways.

Discussion, Conclusion & Suggestions

Face to face interviews were conducted to get the in depth views of teachers about the mobile writing application from the basis of "perceived ease of use, perceived usefulness, perceived enjoyment, aspects need to be improved and future use". Their views seem to be positive most of the time though there were several constructive criticisms given during the conversations. The remaining section discusses these views.

Views of teachers about the *"Perceived Ease of Use"* show that all of them found the use of the application easy. Similarly, Kagohara et al. (2013) underlined using tablets is easy. In this study, special education teachers emphasized that students have already used tablets in their daily lives. Also, Kagohara et al. (2013) emphasizes that tablets can be easily available. Students had not used a stylus pen. However, they could adapt to it in a very short time. Even a teacher said that writing on a tablet with a stylus pen is easier than writing on paper with a pencil. The reason is that the stylus pen does not encounter any friction force on the tablet surface; on the contrary, it can slip easily. However, in order to write on paper, it is necessary to apply a little force. Similarly, Tseng and Cermak (1993) mentioned that the applied force and good writing are directly proportional. However, teachers suggested that the stylus pen's grip angle should not be a problem and the palm rejection feature should be more effective.

The views of teachers on the "*Perceived Usefulness"* reveal that the application is useful for students with dysgraphia. In line with this, Arpacık (2014) revealsed that special education teachers believed that the interactive board is very useful for students with intellectual disabilities. Likewise, Doğan (2015) revealed that teachers stated the usefulness of the technology to provide a better learning opportunity for students with intellectual disabilities. In line with this, in Eliçin's (2015) study teachers emphasized that the tablet application was very beneficial for students with autism.

In particular, they emphasized that the application had an important role in attracting students and increasing their motivation. While they do not want to write too much in traditional lessons, now they say that they want to write by using this application. Moreover, teachers said that they know when students write some letters

incorrectly. Owing to the application, teachers can correct their mistakes and guide their students correctly. They expressed that since the application allows them to see where students make mistakes, they have a chance to focus on these mistakes more. They use worksheets daily and have to prepare and print them out every time so they are consuming paper and they have to keep the worksheets. However, owing to this application, they said that they would no longer have to deal with worksheets; they could reduce both paper consumption and their archiving. In addition, they observed that since the application allows the students to study more, they can write more accurate and faster than before. They stated that students' writing skills improved more after the use of the application than the traditional practices in the 4-5-month period. As a result, teachers considered that the application is useful in terms of keeping the students motivated when they study and facilitate teacher's activities. Similarly, Fedora's (2015) study on teacher candidates showed that using tablet and dictation software for students with writing difficulties was helpful for preservice teacher in helping them be ready and confident for integrating these technologies in their future classrooms.

The views of teachers on "*Perceived Enjoyment"* show that all the participants found the application enjoyable for students with dysgraphia. They emphasized that if it was not enjoyable, they would not study at least 80% of the session. They even observed that they were more enthusiastic about their lessons. Since the application had an educational scenario and was supported with visuals and audio elements, students did not see the application as a lesson so they did not get bored. One of the teachers stated that one of his students normally study for a little time but he was surprised to see that the student studied almost the whole session. Similarly, Eliçin (2015) revealed that teachers emphasized that students with autism were more interested in tablet application than the traditional lesson. In the current study, only one teacher mentioned that traditional education could be more enjoyable than the application. In traditional educational settings, special education teachers can start a different activity when students are tired/bored of writing considering the situation of their students. In addition, they can give small breaks or play games. Nonetheless, the application was not developed to completely take the place of a teacher. On the contrary, it was developed in order to support the teacher's teaching activities and to allow the students to do practice much more on their own.

The views of teachers on "*Aspects that Need to be Improved*" about the stylus pen, application, and their interaction seems to be positive most of the time. However some of the teachers indicated that the stylus pen and the interaction with the tablet should be improved. One of them indicated the lack of using lines in the animations as a weakness and suggested to the researcher that lines should also be incorporated within the animations. The researcher took this recommendation as a note and reported in the study for further studies. In addition, one of the teachers mentioned that the application accepted some letters as correct when students wrote similar letters. It is obvious that the writing movements of some letters are very similar. Sometimes it is inevitable that the application may detect a similar letter instead of the correct one. Such problems can be encountered not only in gesture recognition algorithms but also in handwriting recognition algorithms. In order to overcome this problem, sensitivity can be increased. Furthermore, a teacher suggested that some virtual rewards should be offered and added to students' profile.

The views of teachers on *"Future Use"* reveal that all of them are eager to use it in their courses with the belief that it will enrich their courses in terms of both instruction and interaction. This result seems to align with the study of teacher candidates in Fedora's research (2015), in which almost three-quarters of preservice teachers

were found to be willing to use such technologies in their future classrooms. In line with this, in Eliçin's (2015) study teachers emphasized that they want to use tablet applications for students with autism since they are useful. Similarly, in Gauvreau's (2015) study the teachers were willing to use the mobile technologies in their classes for children with autism.

Special education teachers in particular thought that the application could attract students' attention in this study. Thus, the students can concentrate and can focus on writing more. As previously mentioned, students with specific learning disabilities have attention problems. It is always an effort to draw attention to important stimuli in learning environments (McNamara, 2007). Computers and these kinds of devices can get students' attention and help them to focus on the learning task. This is crucially important in the case of students with learning disabilities (Fernández-López et al., 2013). Similarly, they can reduce attention problems arising in mainstream classes (Zhang, 2000). Likewise, the teachers emphasized that the tablet application could increase the attention span of students with autism (Eliçin, 2015).

Since such an application can be improved and updated easily, teachers thought that they could access the latest accurate information with the help of the application. Teachers reported the advantages of the application, serving as a facilitator both for their students and themselves. They noted the value of the application as an instrument that can enable them to prepare for lessons while reducing the preparation time required for regular classroom activities. In addition to being a supportive instrument, the application also helps teacher to monitor their students' progress based on real data as well as to diagnose mistakes and misconceptions students make during the learning process. Although this study contributes to the literature and the practice field, it is limited to seven special education teachers working in Istanbul.

Ethic

All procedures in this study involving human participants were carried out in accordance with the ethical standards of Middle East Technical University Research Ethics Committee with number 2016-EGT-095.

Author Contributions

This article was written with the joint contributions of both authors.

Conflict of Interest

The authors declare that they have no conflict of interest.

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